

AVIATION WEEK

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MAY 30, 1955

50 CENTS



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2600 Ridgway Road, Minneapolis 13, Minnesota



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(JG7005)



Rate Gyro
(GG13)



Miniature
Rate Gyro
(GG16)



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Available in both standard and miniature socket nut and gang channel configurations, Kaylock nuts are precision products produced in full conformance with Air Force-Navy specifications AN-N-5 and AN-N-10.

RESEARCH KEEPS **B.F. Goodrich** FIRST IN RUBBER



World's first 300 mph tire dynamometer, tested at R. F. Smith's Shop, Ohio plant



W. A. Gaudichon 120-watt downlights installed at Wood and Bruce Plots, Torr. Ont.

B. F. Goodrich lands plane indoors so you can land it better outdoors

Two symmetrical doors give D. P. Goodrich tires, wheels and brakes the toughest tests they can get. They simulate landings at speeds up to 250 and 300 mph.

As top right you see a new B F Goodrich airplane. Takeless Tire as it shows against the dynamometer's rotating wheel under 10,000 lbs load instantly develops 4,000 rpm—a combination of impact, friction and centrifugal force that will disintegrate an ordinary tire. What happens? After 18 footings—the time that would take the new B F Goodrich Takeless Tire to roll good for more. Result, the world's only 320 mph Takeless Airplane Tire is now ready for the Navy.

In the lower chertmass, B. F. Good.

rich wheels and brakes for a modern jet bomber are going through a retooling of sort. The brake dynamometer and wheel stress the energy developed by the rotating mass. At the proper moment, the wheel, tire and brake assembly is "landed" at the bomber's take-off speed—and under a load equal to the bomber's weight (which is over 50,000 lbs. per wheel).

Secondly, the brakes are applied. They have to stop the dynamometer wheel and absorb all the energy in a matter of seconds. The single wheel and dual brake combination must absorb more than 30,000,000 ft-lb of kinetic energy—as much force as a grand slam by stopping approximately 55 automobiles going 60 mph—but the E. F. Goodrich brakes have the time to a standard in the

sperical leading rim which assures a wide stepping distance. The wheel is self-centred.

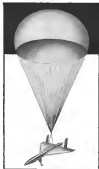
How do you benefit? We can give you faster delivery by speeding up qualification of our steel, wheels and bolsters to your specifications. And we give you better loading assemblies because we can quickly confirm new engineering and design ideas. With our unmatched testing and research facilities, we're looking forward to helping you solve some of your loading and take-off problems. The B. F. Goodrich Company, Akron/Steel Tube, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



The Use of the DEL MAR DELTA Aerial Tow TARGET permits Assessment and Evaluation of MISSILE WEAPONS SYSTEMS!

DEL MAR DELTA recovered by PIONEER PARACHUTES



Perfection of America's arsenal of rockets and guided missiles is being accomplished efficiently and economically in the Air Force Missile Development Program.

In this instance the Del Mar DELTA high speed, high altitude tow target provides a stable platform to every Miss-Distance Indicator System for missile evaluation progress and is fully recovered from the air by Pioneer parachutes, to be used over and over again.

This is one of the many examples where the taxpayers' money is used wisely by the Armed Forces. The design and manufacturing facilities of both the Del Mar Engineering Laboratories of Los Angeles, and the Pioneer Parachute Company have combined to serve both the Armed Forces and the nation's economy.

Pioneer engineers are constantly working with engineers of aviation companies, as well as the U.S. Air Force, developing and manufacturing special products for special uses. We are ready to serve you—our engineering staff is available for consultation whenever you may be located.

PIONEER PARACHUTES MAKE THE DIFFERENCE!



PIONEER PARACHUTE COMPANY, INC.
MANCHESTER, CONNECTICUT, U.S.A.

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IN CANADA - Pioneer Parachute Company of Canada Limited • Omaha Falls, Ontario

Domestic

Sperry Gyroscope Co. resumed production on a \$20-million backlog of defense orders last week after 7,000 members of the International Union of Electrical, Radio & Machine Workers (IUEM) voted to accept a two-year contract and end their 15-day strike at three plants in Long Island. The new pact calls for an immediate 5-cent an-hour raise plus an additional \$3 cents next year.

Ryan Aeronautical Co. received a contract from Cessna-Wright Corp.'s Aeronautical Division to produce after burners for a "new jet engine." Amount of the San Diego firm's new contract more than \$1 million.

Titanium pilot plate will be built and mounted by National Research Corp. at Newton, Mass., under a \$1,185,000 contract awarded by the General Services Administration. Designed to produce 1,800 lb. of titanium a day, the plant will demonstrate the company's new non-Kroll process.

Timco Aircraft Corp. received a Navy prime contract for a limited number of the Alpha subsonic electronic system. It is the first Timco-designed product ordered into regular production by the Navy.

Aerjet-General Corp.'s LR6(A) liquid-propellant rocket is being tested on their Republic F-84Hs at Edwards AFB, Calif.

H. M. Sawyer & Son Co. has purchased by a group headed by Charles F. Poole, president of the firm Sawyer, with plants at Cambridge and Watertown, Mass., production control systems from

de Havilland Aircraft Co. will send its first engine Hecan 2 to a demonstration test of the U.S. test center in the effort to increase capacity and short-lead transport sales.

Boeing 707 made its 100th test flight at Seattle May 29, making flight time of USAF's prototype jet trainer now set to start less than 750 flight hours.

Transocean Air Lines signed a contract to furnish Lufthansa with 10 navigators for one year for trans-Atlantic flights.

Makewell Airlines and the Air Carrier Mechanic Assn. (AFM) signed an



Outboard Powers One-Man Copter

Goodrich Aircraft Corp.'s one-man GA-409R, starts its vertical lift on power supplied by a 30 hp outboard motor. Pace of this small helicopter would be about 35,000, if produced in quantity. Designed as a liaison craft, the GA-409R can fly at speeds up to 64 knots. It weighs 235 lb. empty and carries a useful load of 200 lb. at normal cruising speed of 40 knots, endurance is 45 min. on 5.1 gal. of fuel. First model of the GA-409R helicopter is making test flights at Goodrich's Alaska plant.

large contract amendment that increases pay by 7 cents an hour since the board. The new agreement will be effective from Aug. 1, 1955, through Oct. 31, 1955.

Financial

Brooks Aircraft Corp., Detroit, reports a net income of \$12,961,000 from sales totaling \$19,751,000 for the six months ended May 31, compared with an \$11,111,000 net on sales of \$11,795,000 for the same period last year.

Armstrong Corp., Jackson, Mich., reported a net loss of \$671,800, in the first half of its current fiscal year, as 1955 amounts over the six months ended May 18, 1955. Sales totaled \$18,576,000, a 10% gain.

Captex Aircraft's net profit increased to \$301,000 during the first quarter of 1955, compared with a net loss of \$111,000 for the same period of 1954. Passenger revenues declined to \$9,990,000 from \$12,717,000.

Jeth & Heitz, Inc., Cleveland, had first quarter earnings of \$199,000 on sales of \$5,007,000, compared with a profit of \$460,000 and sales totaling \$5,997,000 for the same period of 1954. Present backlog of orders \$32.5 million.

Sperry Corp., New York, declared a

second quarter dividend of 50 cents, payable June 22 to stockholders of record June 1.

McDonnell Aircraft Corp., St. Louis, will pay a regular 25-cent quarterly dividend July 1 to shareholders of record June 17.

Salle Aircraft Co., San Diego, declared a regular quarterly dividend of 25 cents a share on common stock, payable July 15 to holders of record June 26.

International

Austrian Government will order approximately 50 new two-place Vought jet trainers from the Hartford Aircraft Co., Ltd. Decision to place the new contract came as the company's first-order plant prepared to shut down after selling out the lot of 43 Voughts previously ordered.

Gos. St. John Copper, 63, ignores thurston power who told Britain's No 2 shipowner, Lord Mier M in Eastbourne, England.

Babcock Helicopters, Ltd., ordered two S-55s and spares from Westland Aircraft, Ltd., Yeovil, England.

Saudi-Arabian Airlines took delivery on the first Convair 440 of its order.



TOPP POTENTIOMETERS



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First ever, you've seen Topp's precision potentiometers only as integral parts of the widely used Topp Multi-reading and calculating devices and angle-of-attack instruments.

Now, expanded production makes these highly reliable potentiometers available to all manufacturers of electronic equipment.

Topp potentiometers have an outstanding record of high reliability. The full line includes the most modern designs in linear and non-linear types; angle turn, oscillation motion and wiper turn; with servo flange, threaded housing and tapered hole mounts. A custom design and manufacturing service is available for unusual needs.

Bring your potentiometer problems to TOPP. We'll solve them with tolerance and performance ratings.



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WHY SPOT FACE AWAY THE FITTING?



Excessive spot facing, weight, and bulk are eliminated from removable fittings such as pinless breakers, when NIS-SHEAR stud nuts are used to carry the shear loads. On the other hand, both ends up secured as installation of the fitting in the shop is on the right step.



Fittings using bolts to carry the shear loads, require spot facing in field areas. These fittings must be heavier in weight to retain enough to avoid stress concentrations and are larger in size to absorb bolt elongation. In contrast, the fitting with bolts utilizes a weight increase of about 30% and requires removal or installation of an additional location bolt.

WRITE for the NIS-SHEAR Standards Manual for specific data on the NIS-SHEAR stud nut.

US and Foreign Branches: Technical



WHO'S WHERE

In the Front Office

A. F. Butler, chairman of the board, de Havilland Engines Ltd., Louisville, England, left second floor May 10, 1955.

Robert P. Loeb, executive vice president and treasurer, General Electric, Inc., 1000 N. Y. St., New York, N. Y., left second floor May 10, 1955.

Honors and Elections

Wing Cmdr. Joseph Wright, inventor of the Navy's "Catalina" Air Force, 177th Composite, awarded the Medal of Honor, 1954.

James C. Floyd, vice president engineering of Aero Research Ltd., 1000 N. Y. St., New York, N. Y., left second floor May 10, 1955.

James C. Floyd, vice president engineering of Aero Research Ltd., 1000 N. Y. St., New York, N. Y., left second floor May 10, 1955.

Changes

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INDUSTRY OBSERVER

►Cessna will build a two-seat version of the P-1000 lightweight Cessna at a high speed for the Navy. Prototype should be flying at Bellport, N. Y., this summer.

►Cessna is adding a pair of Fairchild H-4 or Continental J-69 turboprops to the P-1000 scheduled for service at the Air Academy at Colorado Springs. The 2,400 H-4 thrust produced by the two turboprops will allow the P-1000 to speed to more than 300 mph. These turboprops will be used for flight operations of USAF cadets at the Academy. High altitude of the field at Colorado Springs would limit performance of the turbo-powered P-1000 without the gain to a point where they would be back-pedaled to perform the Air Academy mission.

►Lockheed Aircraft Corp.'s 1049G Super Constellation has been certified for a gross weight of 137,169 lb. by the Civil Aeronautics Administration.

►Atomic Energy Commission is seeking bids on the heat to be produced in experimental operation of the sodium graphite reactor under construction at North American Aviation's Santa Susana facility. Southern California Edison Co. already has submitted a proposal to purchase the heat and install the necessary equipment to convert it to electricity.

►Aviation progress gets 45 cents from each dollar Air Force pays. Conrail on its 30th progress compared with 30 cents Conrail retains for its own efforts.

►A truck-mounted, high precision loadcell used in instrument landing systems is being produced for the Air Force by Federal Telephone and Radio Co. The precision unit, which weighs 80-lb. stainless steel, is used to furnish load beam for auto-pilot controlled low approaches. Ready design was built at the rate of six units, some loss-of- and distortion of standard loadcell beams.

►Standard carrier rollout and landing tests of Lockheed Aircraft's T2V-1 were scheduled to start last week at (Troyes) Naval Air Station. Lockheed test pilot Jay Chavall will fly the carrier-based transport prototype during the six-week test period.

►Royal Canadian Air Force has placed a \$1.4 million order with de Havilland Aircraft of Canada for 90 Chipmunk trainers. RCAP order is based on a plan to have an elementary trainer available for fast training of pilots in the event of an emergency. RCAP is currently considering a replacement for its Harvard trainer with U. S., British and French jet trainers being studied for that purpose.

►Lockheed Aircraft is producing P2V-7s at a rate of eight a month. Production of P2V-7s is at a rate of 11 a day.

►Tests of the Algeciras III helicopter, powered by a Turbomeca engine, are under way. Initial performance figures show that the aircraft has a considerable reserve of power at an all up weight of 2,575 lb. Forward cruising speed is about 110 mph. French Navy has ordered three of the Algeciras III helicopters.

►Engineering on Lockheed's advanced jet trainer design contract will be done at the Martins Co., Detroit.

►No flying unions have been officially recognized in Canada. W. B. Smith, senior union organizer at the Department of Transport, Ottawa, told the Canadian House of Commons Committee on Radio. A special electronics electronics station had been set up by the department near Ottawa in 1953 and continued its operation during 1954 to ensure objects outside the radio's operation. After more than a year's operation the operation was stopped, under no date of any significant importance had been collected during that period.

Exit Corney, Enter Burke

Ret Admiral Arleigh A. "Bull" Burke, 55-year-old veteran of Vietnam and computer viruses, was selected by President Eisenhower to succeed Admiral Robert B. Corney, Chief of Naval Operations who tangled with the Administration on the outbreak of war in China. Corney is scheduled to retire Aug. 11, following General Matthew B. Ridgway, Army Chief of Staff who crisscrossed with the Administration on Army manpower cuts.

Continued chairmanship of the Joint Chiefs of Staff by the Navy was issued by the President's nomination of Admiral Arleigh W. Burke to replace Corney two years in that post. At the same time he has called for resignation of General Nathan F. Twining to serve another two years as USAF Chief of Staff.

Choice of Burke is GAO, including advancement to full admiral, puts this 1919 Annapolis graduate over the heads of 50 officers who struck him as security. In addition to his claim to fame as a World War II destroyer leader, he was hero of "Operation 25," the original Navy opposition to USAF's B-36 bomber program.

While House seemed that Corney's retirement does not rattle from his tenure, "lost" to the past, the House Committee would be in a position to attack Corney and Marine to late Apr. 15. Ridgway's resignation is an ICA chairman in the role and for a while, he is eligible. Twining, now scheduled to lead USAF until June 30, 1977, is 57 years old and would be eligible to succeed Ridgway at that time.

Houmon Meets AIA

In his first direct approach to the aircraft industry, R. Earl Houmon, new Deputy Assistant Secretary of Defense for Public Affairs, appeared at recent Washington meeting of the Aircraft Industries Association. Houmon, Chairman of the House Public Affairs Committee, said a plan to industry cooperation was "just one" of unbridled collaboration which he holds "strategic". Houmon called on AIA, which already has rejected his invitation to lead him as AIA representative (AW May 2, p. 11), to negotiate his terms and submit a detailed statement to his staff for clearance. Committee members suggested that Defense Department should offer its classification system if necessary, and difficulty of controlling their operations without clearance rates. Houmon then promised for cooperation respecting Secretary Wilson's attention that new plan will work if it is tried, and urged that industry public relations men confer with his office. Reception to Houmon's proposal was cool.

Debate was added new paragraphs to existing ASFR Section XV declaring that allowances for depreciation as provided by the Internal Revenue Code will be acceptable for costing purposes on contracts placed after Jan. 1, 1975. Industry reaction is one of optimism, with hope that the trend is toward a more realistic viewpoint. On the other the new ASFR paragraphs are intended to clear up an existing obscure point, but the shift in philosophy has been noted as significant.

Subsidy Outlook

The House left the door open for Civil Aeronautics Board to request additional subsidy funds. The subsidy request was reduced \$13 million by the House Appropriations Committee (see p. 93).

Pointing out in floor debate that the committee trimmed the \$45 million asked by the Board to \$40 million, Rep. Bruce Proctor, chairman of the Committee on Commerce, observed that "While it may be necessary to provide some additional funds for this purpose at a later date, the committee recommends it adequate for the Board to commence operations during the next fiscal year. The committee feels that this approach to the problem of financing or raising subsidies is desirable, so that it encourages the Board to take whatever steps may be necessary to protect the taxpayers in handling of their claims."

On advice, CAB decided that the only "strong" bid to the \$45 million was that it should not be used to pay claims whose payments might be affected by the Supreme Court's "offer" decision. FAA and Board are the only two.

This is what the Board plans to do:

- The \$16 million CAB already has on hand, Apr. 22, it to be used for FAA and Board payments \$15 million will go toward making FAA's first estimated claims for the period of \$4.7 million and \$155,000 will meet Board's estimated \$155,000 total in claims.
- The \$8.9 million will be used to pay all other claims—without priority—on their claims \$4.6 due. The Board stands its deficit for the period will be substantially less than the \$5.1 million calculated some months ago. For example, payments for Hawaiian operations have already been reduced \$700,000. The claim the Board can't pay, though, will be met out of Fuel 1955 funds, which will probably be available soon and July.

FAA is confident that Board will meet its claims out of new funds for the coming fiscal year.

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Procurement Revision

Defense Department has postponed the deadline for receipt of proposals and suggestions to its proposed revision of Section XV of the Armed Services Procurement Regulations (ASPR) (AW Apr. 25, p. 12). Originally set for May 21, industry observations were solicited or received up to June 30. In addition to request, opportunity to more stringent control over availability of loans and program costs, it now appears likely that strong objections will be offered to at least two other items, the first that most aircraft firms will have to serve their contracting processes and an alleged discrimination in expense for general research. From predominantly in defense work but through them, will be at downsizing under terms which make "false start" research costs "flexible" only, for competitors who do 75% of their business with non-government customers.

Meanwhile, Defense has added new paragraphs to existing ASFR Section XV declaring that allowances for depreciation as provided by the Internal Revenue Code will be acceptable for costing purposes on contracts placed after Jan. 1, 1975. Industry reaction is one of optimism, with hope that the trend is toward a more realistic viewpoint. On the other the new ASFR paragraphs are intended to clear up an existing obscure point, but the shift in philosophy has been noted as significant.

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—Washington staff

How G-E drive provides jet engine starting and a-c power from one engine pad

Having only one engine pad available for both jet engine starting and a power, Douglas Aircraft faced a difficult problem in the design of the A4D Skyhawk. The flexibility of the General Electric 9 KVA hydraulic constant speed drive permitted the addition of starting, grew with an powerment penalty and only a small increase in weight.

Ideal for airborne applications, the G-E constant speed drive features a ball piston design that provides

light weight and high reliability due to the small number of moving parts and simple mechanical operation. Drives can be supplied from 9 KVA to 66 KVA for most engine speed ranges.

FOR SPECIFIC INFORMATION on how the General Electric 9 KVA hydraulic constant speed drive can be tailored to your particular application, contact your nearest G-E Apparatus Sales Office.

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9 KVA constant speed drive with engine starter adapter

manly development and production from Sen. Richard Russell, chairman of the Senate Armed Services Committee. Sen. Hiram Boren, chairman of the Joint Congressional Armed Forces Committee. Sen. John Kennedy and Sen. Margaret Chase Smith.

Administration defense is the ring of fire around the head of the Russian armaments drive and the U.S. military aid policy was to steady nerves that Russia does not yet have all of the elements required for total air superiority. It delayed an attempt to get down to top priorities in the

question of whether Russia had significantly increased the U.S. lead in aircraft development and production and was now outpacing in these fields at a more rapid rate than the U.S.

However, representatives were already being left by aircraft manufacturers. They were ordered to accelerate work on production programs in the Soviet Union, to get new aircraft at Seattle and Wichita and the Convair F-102 program interrupted at San Diego. Another program expected to be accelerated is the Lockheed F-104 supersonic day fighter now being built at Burbank.

Sen. Stenographic seemed Secretary Wilson of withholding "the truth" from the American people about Russia's armaments drive.

He said Mr. Wilson only released information about Russia's development when "forced" to do so by poor analytical disclosures or congressional inquiries.

Sen. Stenographic was referring to Mr. Wilson's detailed disclosure on May 24 of the new type of plane shown over Moscow.

"Wilson, in a rebuttal to the Democratic questioning, asserted that the United States was maintaining 'a military capability superior to that of any potential enemy'."

Sen. Stenographic, firing back at Wilson, said he had never heard that Russia had gained an superiority over the U.S. "What is a lethal of, the answer and is that Russia 'is' in the process of surpassing us?"

Sen. Stenographic said "one of the bad things about the present situation is that Mr. Wilson is not giving the truth to the American people until forced to do so."

Sen. Stenographic, Air Force Secretary in the United States, asserted that Wilson had admitted that the information about the Russian plane had been known for some time.

"If that is true," Stenographic said, "why didn't he release the information of waiting until the pressure was on him?"

Sen. Jackson and Wilson "bids to tell the American people that our lead is only temporary."

"Based on Russian airplane progress to date," Jackson said, "it is only a matter of time until they will be able to surpass us in the air."

"The best proof that Wilson is not telling the full story and come, when the Air Force is compelled to step up its production of B-52 bombers and other jet types planes," Jackson said.

London—British Orpheus turboprop designed for light aircraft production completed an 180-hp. test at a wing of 3,185 lb. The engine weighs 746 lb. for a thrust-weight ratio of 4.4, higher than any British engine to pass 150-hp. test.

First Orpheus was last Dec. 17, when then, Bristol had completed at least five engines, all now available for test running. Among them is one rated between 1,500 and 1,590 hp., and weighing less than 850 lb., for a thrust-weight ratio approaching an 8.5. By the time the turboprop is fully tested, it will be a six-to-one ratio, but it is a short-life engine, and does not need to qualify at 150 hp.

Aircraft Firms Lead Contract List

Aircraft and related industries were the least's share of Defense Department recent prime contracts in the 18 months from July 1, 1953 to Dec. 31, 1954, and Defense Secretary Charles E. Wilson expects that aircraft and related industries contracting.

Figures released last week by the Pentagon on the 100 firms receiving largest net value of contracts in the period show that aircraft and related industries are listed 58 times. The top 11 firms in total all were aircraft companies, which alone received more than 41% of the total dollar awards.

Top ranked was the Lockheed Aircraft Corp. and its subsidiaries. They sold \$1,051.1 million of equipment which included Pratt & Whitney engines, Sikorsky helicopters and Hamilton-Standard propellers. United's share of the total defense contract business in the period was 6.5%.

Other leading firms were Douglas, North American, Boeing, Lockheed, General Dynamics (Convair), General Motors, Westinghouse, Republic, Hughes and Martin.

Statistics Wilson said he is confident

that the existing aircraft program are substantially consistent to most current U.S. requirements. He indicated that the trend to broad firm domination of the field in the specialized prime contractors and that even another national emergency there will be less demand of the field by companies primarily in outside fields.

Defense Department's figures were compiled at the request of congressional committees. Accompanying the list of awards from 1953 to the end of 1954 was another listing firms that had done so during the top 100 Defense Department companies.

These companies, including 12 in the aircraft and related fields, for the most part had suffered contractions and cutbacks in the post-Korean period.

No data was given on buildings, but the Defense Department and some of these firms still remained among the most important suppliers of military goods despite the fact that they did not figure in the list of 100 top contractors in 1954.

Top contract was shown in General Motors Corp., since the government's

Lag on New Awards

Here is a list of corporations in the aircraft and related industries who were among the 100 largest military prime contractors in 1953. In 1954, they were among the first 100 in awards made in the following 18 months. The latest "CR" is the last column for net value. The figures amount left after contractions and cutbacks extended new government awards made in the period.

Rank	Company	Awarded (in millions)
1	General Motors Corp.	\$1,051.1
2	Lockheed Aircraft Corp.	\$1,051.1
3	Westinghouse Electric Corp.	\$750.0
4	North American	\$750.0
5	Boeing	\$750.0
6	North American	\$750.0
7	Boeing	\$750.0
8	Boeing	\$750.0
9	Boeing	\$750.0
10	Boeing	\$750.0
11	Boeing	\$750.0
12	Boeing	\$750.0
13	Boeing	\$750.0
14	Boeing	\$750.0
15	Boeing	\$750.0
16	Boeing	\$750.0
17	Boeing	\$750.0
18	Boeing	\$750.0
19	Boeing	\$750.0
20	Boeing	\$750.0

largest defense supplier. Contractions of contracts with GPO exceeded new procurement from the company by nearly \$60 million.

Companies Among 100 Largest Military Contract Winners

Corporations in aircraft and related industries included among top 100 firms in net value of military prime contract awards made in the 18 month period from July 1, 1953 to Dec. 31, 1954.

Rank	Company	Awarded (in millions)	Percent of Total	Rank	Company	Awarded (in millions)	Percent of Total
1	General Motors Corp.	\$1,051.1	42.0	41	Thompson Products, Inc.	\$15.0	0.5
2	Lockheed Aircraft Corp.	\$1,051.1	42.0	42	Massachusetts Institute of Technology	\$15.0	0.5
3	Westinghouse Electric Corp.	\$750.0	29.6	43	Boeing Aircraft Corp.	\$15.0	0.5
4	North American	\$750.0	29.6	44	Northrop Aircraft Corp.	\$15.0	0.5
5	Boeing	\$750.0	29.6	45	General Tire and Rubber Co.	\$15.0	0.5
6	Boeing	\$750.0	29.6	46	Boeing Aircraft Corp.	\$15.0	0.5
7	Boeing	\$750.0	29.6	47	Boeing Aircraft Corp.	\$15.0	0.5
8	Boeing	\$750.0	29.6	48	Boeing Aircraft Corp.	\$15.0	0.5
9	Boeing	\$750.0	29.6	49	Boeing Aircraft Corp.	\$15.0	0.5
10	Boeing	\$750.0	29.6	50	Boeing Aircraft Corp.	\$15.0	0.5
11	Boeing	\$750.0	29.6	51	Boeing Aircraft Corp.	\$15.0	0.5
12	Boeing	\$750.0	29.6	52	Boeing Aircraft Corp.	\$15.0	0.5
13	Boeing	\$750.0	29.6	53	Boeing Aircraft Corp.	\$15.0	0.5
14	Boeing	\$750.0	29.6	54	Boeing Aircraft Corp.	\$15.0	0.5
15	Boeing	\$750.0	29.6	55	Boeing Aircraft Corp.	\$15.0	0.5
16	Boeing	\$750.0	29.6	56	Boeing Aircraft Corp.	\$15.0	0.5
17	Boeing	\$750.0	29.6	57	Boeing Aircraft Corp.	\$15.0	0.5
18	Boeing	\$750.0	29.6	58	Boeing Aircraft Corp.	\$15.0	0.5
19	Boeing	\$750.0	29.6	59	Boeing Aircraft Corp.	\$15.0	0.5
20	Boeing	\$750.0	29.6	60	Boeing Aircraft Corp.	\$15.0	0.5
21	Boeing	\$750.0	29.6	61	Boeing Aircraft Corp.	\$15.0	0.5
22	Boeing	\$750.0	29.6	62	Boeing Aircraft Corp.	\$15.0	0.5
23	Boeing	\$750.0	29.6	63	Boeing Aircraft Corp.	\$15.0	0.5
24	Boeing	\$750.0	29.6	64	Boeing Aircraft Corp.	\$15.0	0.5
25	Boeing	\$750.0	29.6	65	Boeing Aircraft Corp.	\$15.0	0.5
26	Boeing	\$750.0	29.6	66	Boeing Aircraft Corp.	\$15.0	0.5
27	Boeing	\$750.0	29.6	67	Boeing Aircraft Corp.	\$15.0	0.5
28	Boeing	\$750.0	29.6	68	Boeing Aircraft Corp.	\$15.0	0.5
29	Boeing	\$750.0	29.6	69	Boeing Aircraft Corp.	\$15.0	0.5
30	Boeing	\$750.0	29.6	70	Boeing Aircraft Corp.	\$15.0	0.5
31	Boeing	\$750.0	29.6	71	Boeing Aircraft Corp.	\$15.0	0.5
32	Boeing	\$750.0	29.6	72	Boeing Aircraft Corp.	\$15.0	0.5
33	Boeing	\$750.0	29.6	73	Boeing Aircraft Corp.	\$15.0	0.5
34	Boeing	\$750.0	29.6	74	Boeing Aircraft Corp.	\$15.0	0.5
35	Boeing	\$750.0	29.6	75	Boeing Aircraft Corp.	\$15.0	0.5
36	Boeing	\$750.0	29.6	76	Boeing Aircraft Corp.	\$15.0	0.5
37	Boeing	\$750.0	29.6	77	Boeing Aircraft Corp.	\$15.0	0.5
38	Boeing	\$750.0	29.6	78	Boeing Aircraft Corp.	\$15.0	0.5
39	Boeing	\$750.0	29.6	79	Boeing Aircraft Corp.	\$15.0	0.5
40	Boeing	\$750.0	29.6	80	Boeing Aircraft Corp.	\$15.0	0.5
41	Boeing	\$750.0	29.6	81	Boeing Aircraft Corp.	\$15.0	0.5
42	Boeing	\$750.0	29.6	82	Boeing Aircraft Corp.	\$15.0	0.5
43	Boeing	\$750.0	29.6	83	Boeing Aircraft Corp.	\$15.0	0.5
44	Boeing	\$750.0	29.6	84	Boeing Aircraft Corp.	\$15.0	0.5
45	Boeing	\$750.0	29.6	85	Boeing Aircraft Corp.	\$15.0	0.5
46	Boeing	\$750.0	29.6	86	Boeing Aircraft Corp.	\$15.0	0.5
47	Boeing	\$750.0	29.6	87	Boeing Aircraft Corp.	\$15.0	0.5
48	Boeing	\$750.0	29.6	88	Boeing Aircraft Corp.	\$15.0	0.5
49	Boeing	\$750.0	29.6	89	Boeing Aircraft Corp.	\$15.0	0.5
50	Boeing	\$750.0	29.6	90	Boeing Aircraft Corp.	\$15.0	0.5
51	Boeing	\$750.0	29.6	91	Boeing Aircraft Corp.	\$15.0	0.5
52	Boeing	\$750.0	29.6	92	Boeing Aircraft Corp.	\$15.0	0.5
53	Boeing	\$750.0	29.6	93	Boeing Aircraft Corp.	\$15.0	0.5
54	Boeing	\$750.0	29.6	94	Boeing Aircraft Corp.	\$15.0	0.5
55	Boeing	\$750.0	29.6	95	Boeing Aircraft Corp.	\$15.0	0.5
56	Boeing	\$750.0	29.6	96	Boeing Aircraft Corp.	\$15.0	0.5
57	Boeing	\$750.0	29.6	97	Boeing Aircraft Corp.	\$15.0	0.5
58	Boeing	\$750.0	29.6	98	Boeing Aircraft Corp.	\$15.0	0.5
59	Boeing	\$750.0	29.6	99	Boeing Aircraft Corp.	\$15.0	0.5
60	Boeing	\$750.0	29.6	100	Boeing Aircraft Corp.	\$15.0	0.5



B-57F THUNDERFLASH runs up to the flying house of Boeing KB-57F tankers for aerial replenishment of its fuel tanks, while another waits in line. The Republic reconnaissance fighter is capable of higher low-altitude day or night missions. From T-44C recently flew from Tokyo to Australia carrying with 1 aerial refueling (AW May 24, p. 7).

freedom we enjoy. The price is the Soviet profit from our efforts.

Shorter Lead Time

A lead point is the comparison of Soviet technological systems with ours in speed of production. I do not mean the speed of one production and assembly line. I am referring to what we call lead time—the whole period from conception of a weapon through development, test, training and finally a combat-capability. With the complex weapons of today, lead time is a matter of years.

There is also evidence that the Soviet technological structure is simpler and more streamlined than ours. These programs are controlled by military necessity and the urgency of getting ahead, then are somewhat confined by democratic processes of deliberation, debate and consultation by the need for consensus.

Whatever the reasons are, we do know that they have produced lead-time responses and their lead time versus the lead is shorter than ours.

Our one rule we have lost down some of our technology. In the Air Force we have recognized and stressed both our research and development activity.

This has used valuable time, but there are other consequences besides that are not so easy to remedy.

For example, our budget cycle. However beneficial that pattern of budgeting may be, it automatically cuts us at time last.

Our desire to build safety into our equipment and the need to keep equipment in service for a long time, our tendency to build multipurpose equip-

ment—all these lengthen our weapon lead time.

We want to do everything we can to reduce it. Under United States policy we will not start a war. This means we must maintain many weapons programs, against many contingencies. By contrast, the Soviets can choose their time and their strategy and work forward. They can select particular weapon systems and put in a crash program. By concentrating in this way they may be able to anticipate progress in specific areas. The danger is that they may do this in time that we believe.

Need for Break-Through

These comparisons of scientific manpower, the urgency of an individual effort and weapon "lead time" indicate how leadheads it would be to assume that we will automatically keep the lead. Technical superiority is not automatic. It must be made to happen.

Of course, a major technological breakthrough could open gaps for the lead at a point or two, then or even five years. But we cannot predict that this will happen. The only way we can make the effort needed for a programmatic improvement. Any breakthrough would then be a bonus. It would be further assistance for us.

The future will not build an accompanying picture unless we make the right decisions and then act decisively. But we cannot neglect the other ways we need to maintain in the beginning—strength—being.

We also up against a concept that could strike at any time. If we cause today—and it could—we would have to

fight it with the trend divisions that are ready to take the field, the airplanes that can fly, and the ships that are about to be. Our strength is being a shield. Behind this shield we are going to work to get better weapons. Our strategy will undergo change. But it must change as our combat strength changes, not as we get the ideas for some new weapon system.

"Despite the impressive strength of the Communists, our prospects for the future look bright. We can fail to win the technological battle only if we fail to recognize its importance."

"Unless we keep our desire to do so, we will have no chance to meet our future developments."

PanAm Will Borrow \$60 Million For DC-7s

Pan American World Airways has completed a \$60-million, 25-year financing arrangement to cover payments on its order for 40 Douglas DC-7s (AW May 2, p. 42).

The DC-7s represent a total investment of a \$110 million.

PAA President Juan T. Trippe revealed the new loan last week at the airline's 27th annual meeting of stockholders in New York. He also reported that PAA's conventional revenues increased to an all-time high of \$44,087,000 during the first quarter of 1955.

Pan American will borrow the \$60 million from 18 investment companies as installments are due on 15 DC-7Cs and seven DC-7Bs. The international air carrier paid a 25% deposit on the new transports and, with three off of depreciation, should be able to cover the remaining 75% with its own financing arrangements.

The loan is in addition to a \$50-million credit agreement negotiated with banks in 1953.

In his report of first quarter results, Trippe and the board reported reported an increase of 21% over the first three months of 1954. Passenger-miles flown during the period gained 26%.

He also forecast no trouble between the United States and foreign countries would be the greatest in history during 1955.

PAA's chief executive backed up that prediction with charts showing that the airline is now winning an increasing share of international and overseas travel from the United States.

Airlines earned an all-time high of 61% of the total international volume last year, Trippe said, and Pan American's share of the 1954 market was 15% of all persons traveling abroad on both air and sea carriers.



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has always taken this old adage seriously!

EEMCO concentrates in the design, development and manufacture of Special Motors and Actuators for aircraft and guided missiles. No one selling this Period.

Throughout EEMCO's entire history, we have devoted ourselves entirely to the design, development and testing of prototype models and to producing quality production of motors and actuators for aircraft industry leaders. EEMCO has always kept pace with the spectacular development of supersonic aircraft and missiles, because we attach to better materials and precision hardware as critical as our standards have been high. Note specifications of the EEMCO products shown below.

A Few Typical EEMCO Products

MOTOR TYPE 6-336. 400 rpm, 150 HP A.C. motor for aircraft duty motor to drive a hydraulic pump on a control system. Fully rated in 1.5 seconds at 45 HP with 2250 rpm, 150 torque at 1.5 HP. Has continuous rating of 1.5 HP at 2200 rpm, 150 torque, 200 watts. Weight 170 lbs.

ACTUATOR TYPE 6-471. Hydraulic universal rotary power package can be used in one small container motor, valve valve, linear, hydraulic clutch and brake, main structure gear and actuating gear for driving adjustable limit switches, light switches and position indicator. Has a wide variety of time-lag adjustment allowing flexible timing to meet load delay or limit switches single or in multiple. Dimensions are only 7 1/2" x 4 1/2" x 2 1/2". Weight only 2 1/2 lbs. Specifications may be used to suit special requirements.

SMALLER ACTUATOR TYPE 6-485. Designed as a timing relay and also for light duty. It has a normal peak load of 20,000 in.-pounds and a total angular load of 30°. Speed is .475 rpm with an average load of 14,000 in.-pounds on a 20 mil O.C. system. Output 0.75 in.-pounds. Stroke 1/16" to 1/8" (100 in.-pounds). Weight 250 lbs. Design incorporates mounting screw take-off and nut passing and stop.

SMALL ACTUATOR TYPE 6-149. This unique linear actuator is entirely self-contained. The motor, clutch, assembly, motor, gear and limit switch are all contained within the smaller outer cylinder. Type 6-149 has an unusually long stroke of 0.125" at 1" per second under a normal load of 4000 lbs. on a 20 mil O.C. system. Maximum operating load is 6500 lbs., maximum rate limit 15,000 lbs. Common Type 6-149 has an adjustable load limit switch, non-springing and stops and a motor that starts off automatically when and stops are reached, or load exceeds a preset load. Weight 12 lbs. 5 oz.

PROJECT ENGINEERS Please Note!

Follow us up into a completely new era, with all the incredible time-consuming design and development that it often takes to develop and manufacture, investigate EEMCO. Consider first, the possibilities of using long a EEMCO EEMCO model. Remember, these motors and actuators are the products of specialists who know design, development and tested years of each revolution produced in all areas and of all industries for many leading aircraft producers. Your inquiry is invited.



TYPE 6-336



TYPE 6-471



TYPE 6-485



TYPE 6-149

Electrical Engineering and Manufacturing Corp.

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When **ONLY** **ROBINSON** SHOCK and VIBRATION CONTROL for AIRBORNE EQUIPMENT

Only Robinson will do what, for best performance, you **must** have complete protection of valuable equipment against shock or vibration —

Or, when you **must** save weight and cost of a device, and only greater protection will make this possible. **You can build a thing stronger or make it less: the latter is by far the more economical procedure.**

Note that even the latest specifications for shock and vibration control are becoming obsolete, because of the rapidity of aeronautical progress.

Unprecedented engine power, speeds, and extremes of temperature subject electronic equipment to conditions never before encountered.

Unless these sensitive devices are fully and properly protected, their performance is interfered with, and their service life shortened.

At stake are no less than the safety of pilots and passengers, the performance of civil and military aircraft, and huge deterioration costs of equipment.

In the military field, it is not too much to say that the performance of jet aircraft and guided missiles is limited by the degree of protection afforded their control mechanisms. **The success of a mission — the defense of an area — may stand on the performance of shock and vibration control mountings.**

WHAT TYPES OF CONTROLS ARE AVAILABLE?

Starting with solid rubber and springs, progress at shock and vibration control has now resulted in one and **only** one method for energy dissipation, which has all the following advantages:

1. Degree of control encompasses with shock or vibration to be controlled.
2. Multi-dimensional absorption — i.e., handling of shock and vibration from every angle.
3. Indifference to extremes of heat and cold and the presence of dirt, oil, grease, or other deteriorative substances.
4. Increase against installation saves reduction of installation time.
5. Long extended and outlasting performance of mountings.
6. Effective reduction of bulk, weight, and cost of equipment protected, from 15% to 25%.

Only Robinson of solid mountings and M-L-Flex Engineered Systems are all six of these controls available. **4 direct comparisons between Robinson and any other method under consideration will quickly prove the presence or absence of these vital characteristics.**

THE INADEQUACY OF SPRINGS

Springs alone, or combined with auxiliary dampers, whose design is most of the work, have been outclassed by the Robinson shock cushion concept. Spring-damping combinations fail because:

1. They are linear in action, and unable to cope with varying loads, or to afford protection against dynamic overloads.
2. They vary in performance with altitude and reduced atmosphere pressure and when dirt, oil, and moisture affect the surface friction between spring and damping devices.
3. Their service life is definitely limited.

HOW ROBINSON ALONE OVERCOMES THESE DIFFICULTIES

The fundamental advantage of all Robinson shock and vibration control is the dissipation of energy by means of fabricated very resilient surfaces and shock pads of patented M-L-Flex.

These cushions, which are **exclusive** with Robinson, have the following advantages:

1. They possess inherent damping throughout, usually five times greater than rubber.
2. Their interlocking wire loops resist compression progressively in the load direction.
3. They are highly effective in multi-directional design and application.
4. They are completely unaffected by changing atmospheric pressures, high or low temperatures, dirt, oil, moisture, or other deteriorative substances.
5. They provide ample protection against dynamic overloads.
6. Their service life is practically unlimited.

Note that in the Robinson Mounting, the spring that surrounds the M-L-Flex cushion acts as a retainer, and Assembly only is a small part of the work to be done. It is the cushion itself carries the load.

WHAT ARE ROBINSON SYSTEMS?

Years of engineering experience supplying shock and vibration controls to more than 500 aircraft and commercial users have taught us that our job is a serious and individual problem. Good as the Robinson individual mountings, our engineered systems are not made simply by attaching a number of mounts to a structure. Using the engineering concepts incorporated in the basic Robinson concept, Robinson engineers work shock and vibration control system for the work to be done — the maximum performance and protection of the equipment involved.

WHO USES ROBINSON?

Robinson is a leading supplier to the Government of shock and vibration control systems for the protection of airborne electronic equipment. Robinson Systems are installed on practically every military and commercial aircraft now flying and in a number of guided missiles, hundreds of designs are on our drawing boards for controls to be used in the years of the future. Robinson Systems are used by most of the leading manufacturers of military and civilian mobile ground equipment, by makers of light and heavy machinery, and by producers of shipping and carrying containers.

WHAT IS ROBINSON'S HISTORY?

Robinson has pioneered in the solution of shock and vibration control problems since 1918, culminating in the final control of the revolutionary M-L-Flex cushion first marketed in 1932.

In 1947 Robinson received from the Navy Department the second for "outstanding cooperation and assistance in producing for the Naval Service new and radically different shock mounts which greatly decreased electronic equipment failures due to vibration."

Steady advances have been made in all-steel mounts and systems in multi-directional mountings (which Robinson has quantity-produced for 4 years), in fully engineered protection. Years of research, laboratory work and practical applications have enabled Robinson Mounting Systems to cope adequately with the formidable problems involved in our defense operations. Robinson now supplies both the airborne and the industrial fields, serving its clients by both Eastern and West Coast engineering units.

The business of Robinson Aviation, Inc. has increased 8-fold in the past five years.

A WORD OF WARNING

Robinson excels and the pressing need for effective shock and vibration control have encouraged the manufacture of low cost mounts and vibration systems which are definitely inadequate for the job that must be done. **If little much does more money making applications, they may not help at the actual requirements of this jet and missile age.**

Robinson seeks only a clear definition of the work to be done, and an engineering approach of all available devices aimed at doing it. **It is on this direct comparison that Robinson success has been built.**

ROBINSON AVIATION INC.
ESTABLISHED NEW JERSEY
Vibration Control Engineers
AIRBORNE DIVISION

West Coast Engineering Office: 2808 Wilshire Boulevard, Santa Monica, Calif.

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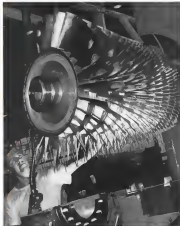
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Pratt & Whitney Aircraft Assembles the J57 Power Unit



LOW-STAGE COMPRESSOR of H₂ is lowered into delivery position at JPLWA plant



INSPECTION of J57 turbojet engine's five-stage compressor take place after complete assembly and final balance of unit.



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**Strong, self-locking threads
for tapped holes in soft metals**

The manually threaded versions are one of two thoroughly tested ESNAs with locking devices. For temperatures up to 250° F, the new locking is available with the famous red nylon locking collar. For service between 250° and 500° F, it comes equipped with the all-metal L26 locking device that has been tested on many types of ESNAs. High temperature neoprene is also available. Both linings are available in sizes #10 through 36" and the locking devices give you performance and reliability you can depend on. For more information, contact AN 30-06 and AN 30-30.



MAIL COUPON FOR DESIGN INFORMATION

100%

Plant utilization also is good. The two DC-4s average about 12 hours a day, climbing from a low point that seldom is below 10 hours to 18 and 17 hours in the peak summer months.

Exclusive distributor for American equipment is Air Associates, Inc., Teterboro, N. J.



**vibration
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designed to combat vibration problems



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CANNON PLUGS



Please refer to page 110

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WHO'S WHERE

(Continued from page 9)

Harold M. Niles, manager of Navy contracts and Roy Schoenbaum, assistant chief of research, Ford Instrument Co., Long Island City, N. Y., division of Sperry Corp.

Robert D. Fogarty, technical manager of the new engineering laboratory established at Pasadena, Calif., by Hamilton-Bendley Corp.'s Aircraft Division.

Donald J. MacPherson, engineering manager, Ferry Controls, Co.'s Aircraft Accessories Division, Van Nuys, Ind.

Donald H. Alder, manager of field project engineering Robinson Aircraft's test cell facility.

Samuel E. Koenig, Washington public relations representative, General Dynamics Corp.

James E. Moss, assistant manager, South-west Airlines Co.'s jet engine overhaul operations at Dallas.

Charles E. Kerner, factory superintendent, Hamilton Sud Products Co., Danbury, N. J.

Philip L. McGinnis, assistant controller for American, Inc., Teterboro, N. J.

Arthur G. Hartman, assistant plant manager of the Aircraft Products Division.

J. A. Mueller, West Coast supervisor of technical sales service, Ray-Che Transcon, Inc.

Carson E. Finkel, military sales representative, AC Spark Plug Division of General Motors.

Derogus F. Bode, Detroit district sales manager, General Motors, Ltd.

Ben Noble, public relations representative at Kearsy City, Kan., for Trans World Airlines.

Arnold E. Ross, sales manager, General Motors Supply Co., N. York.

Oliver V. Mahoney Jr., New York district sales manager, Northland General Aviation.

J. F. Dillman, special coordinator, Dow Corning Corp., Midland, Mich.

Kenneth G. Lowe, Western region manager, Raytheon Division, Raytheon Co., Los Angeles, Calif.

Raymond W. Mahan, systems sales platform, Northland District Aviation.

Max DeLongue, general sales manager, Vibration Manufacturing Co., Calver City, Calif.

Maurice A. Bachellette, distributor sales representative, Sargent American Co., Dallas.

Walter B. Yarnall, sales and service manager, McCulloch Industrial Corp., Dayton.

Walter W. Buckle, technical regional sales manager, Trans Canada Air Lines.

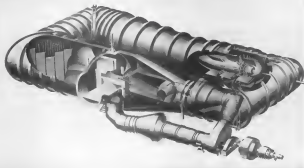
Robert P. Binkley, principal traffic manager, California Central Airlines.

Kenneth Harfield, quality control supervisor and Wakefield D. Kinsler, assembly overhaul shops superintendent, Avco, Inc., Mason, Ohio.

John G. Heflin, assistant controller manager, Southwestern Airlines Division of Southwest Airlines Co. (Barkland, Ill.).

Andrew W. Moley, on loan from Trans American World Airways to American at office of the maintenance training school in its headquarters Colombia.

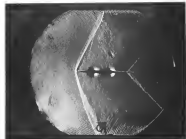
Gregory T. Finkel, military sales representative for AC Spark Plug Division of General Motors, Fall River, Mass.



TRANSonic THROAT of modified Cornell Aero Lab tunnel will be 8 ft. square and, like present 3-ft.8 in. section, will use perforated walls.

Scientists Clear Wind Tunnel Throats

By David A. Anderson



REFLECTIONS OFF walls from shock wave at Mach 1.26 are transmitted by perforated throat in Cornell tunnel. Alternate shock and expansion waves at wall merge quickly

The tag of transonic tunnel testing breaks has not yet been completely unspooled.

Two variations on the basic theme of the ventilated throat, invented and patented by scientists at the National Advisory Committee for Aeronautics, have improved recent operations with a pair of transonic wind tunnels.

At Cornell Aeronautical Laboratory, a perforated throat reduces the interference of shock waves reflected from the tunnel walls, permits the use of larger test models to give more accurate test results.

At Boeing Airplane Co., downstream diffuser recovery down-filled "blowing" helps maintain the power required for the high-speed testing.

The Theory

Behind these two refinements lies a long history of development and a technological breakthrough. The development began before 1942 at NACA, the forerunner of the current



BOEING BABY TUNNEL is a non-feedback tube, was valuable development tool.

cept of the ventilated throat, conceived and developed by John Shack and his associates in 1940.

Before then, transonic tunnel testing was impossible. There were some tricks to get limited numbers of test points, but full range, thorough aerodynamic research was impossible.

The reason lay in the characteristics of wind tunnels and of transonic flow. Any obstacle stuck in a pipe—and a wind tunnel is, for theoretical analysis, simply a pipe—obstructs the flow. It's possible to block the flow completely, if the obstacle is big enough, if it is smaller than the diameter of the pipe, then the air rushing through the pipe must speed up to keep the flow constant.

A test model partially blocks the wind tunnel test section. If the model is small enough, and the flow is slow enough, there is no trouble. Make the model bigger and the speed higher, and the trouble begins. The cross-sectional area of the test section is smaller at the model than it is upstream, the air must accelerate to get past the model. As speed approaches the sonic mark, a local shock will form at the model.

But when the shock forms at the model—because local flow has reached sonic speed even though the tunnel outlet stream has not—flow characteristics change. For all practical purposes,

the tunnel won't operate any faster without an enormous expenditure of extra power. The flow on the model is not an accurate picture of the flow that exists at the free stream tunnel speed.

The formation of the local shock and its consequent blocking of the tunnel is called "choke."

However, choking is not the only problem. One of the worst, which plagues wind tunnel technicians and always will, is accounting for the effect of the walls.

Wind tunnel walls confine the flow and impose a rigid outer envelope on the tube of air passing through. Subsonic flow streamlines that have to curve to get around the test model actuate that curvature at a considerable radial distance from the model. If the model is small and the test section large, then this wall interference is unimportant. But for larger models and higher speeds, the flow pattern is disturbed by the presence of the walls.

Now can the walls be removed? There still exists interference between the moving stream of air and the static air envelope outside the test section. This interference tends to distort the flow, also, but in a sense opposite to the wall effect.

Different flow conditions of supersonic speeds also present problems because of the wall effects. Shock waves

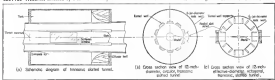
TUNNEL AND FLIGHT FLOW



generated in the case of the model are reflected from the walls and re-interact the test section flow pattern. If these reflected waves hit the model, the flow pattern around it becomes unimportant and the test results mean nothing.

Removing the walls doesn't solve the core either. Instead of a compression wave focused at the same expansion wave focus as the flow inside the tunnel tries to adjust to the presence of the flow outside. These expansion

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water also can be reflected and into the sea.

Considering these objectives, it seems that under normal tunnel techniques, the model would have to get smaller in the rapid movement.

It would have to be smaller in cross-sectional area to delay choking and to minimize soil subsidence at extreme speeds; it would have to be shorter at excessive speeds to avoid troughing next to the jet's shock waves.

As a matter of fact, under the old scheme, the model would have been vanishingly small at Mach 1. These frustrating facts stirred the idea of thinking that let Stack and his men stay to the idea that inviscid and wind tunnel testing and made a technological break through possible.

It was a simple solution, but not at all obvious. The answer was to vent into the test section of the wind tunnel by cutting slots in the tunnel walls in direction of flow. These slots simply bypassed air around the test section.

The slots solved the model blocking airflows to carry mass and choking did not occur. The combination of some compression shocks and some expansion waves, passed to a net result of essential inflorescence for supersonic testing. Although this did not completely prove itself.

Thus, was a "tunnel" tunnel. Mach number could be increased by a factor increase and variation in Mach number could be obtained with power variation.

Design of the tunnel that got under way in 1946. NACA was given the one of its most valuable wind tunnels and millions of dollars in the ability and seriousness of its team of scientists.

The first transonic tunnel operations began in late 1950 at the Langley Laboratory of NACA. A few months later, the second tunnel was completed.

Now, both Langley and the Ames Aeronautical Laboratory of NACA have these useful tools.

Cornell Tunnel

With more than two years of transonic test experience, Cornell Aeronautical Laboratory is currently loaded with a backlog of 1,000 test hours scheduled for the next six months in its transonic tunnel. CAL operates a 3-ft. test section fitted within the 34-1/2-ft. variable-diameter tunnel, but is about to install a permanent 10-ft. square transonic test section.

Cornell's tunnel is based on the same principle that gave the NACA its transonic tunnels, but there is a refinement aimed at reducing even further the effects of reflected shocks.

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*Source: Aviation Week Research Dept.

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1. First half of 12-page feature engineering article, "Scientific Research: Major Role in Progress: John Galt, Editor," by Editor Engineering Editor David A. Anderson.



69%
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2. Three-page production article — last story "How Will New Control Affect the Future," by Editor Engineering Editor David A. Anderson.



90%
Readership

3. Shortest feature article, "Specialized Machine Near Airline (SMA)," by Editor Editor David A. Anderson.



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the compression and expansion forces generated by the closed and open parts of the throat do not cancel each other, and there are some reflections back across the test section. The more slots there are, the relatively weaker each section is.

The tests in consideration of a jet engine throat. Suppose, instead the Conell sections, the throat were perforated with lots of tiny holes instead of the bigger slots. Then the expansion and compression waves would be weak, close together and could cancel each other.

Small-scale tests were begun in 1940 with natural bronze orifice, and later repeated with commercial perforated metal mesh to approach a punched structure. These were started in 1946; by late 1952, the 3646 test section was in operation. Plans were the first perforated wall tests in the country.

Conell engineers say that the perforated wall works in other ways to increase the efficiency of the throat. The test section is surrounded with a plenum chamber which can be evacuated with a vacuum pump. This is equivalent to increasing the area of the test section and avoiding the Mach number by controlling the amount of pumped air.

CAL based time is about half devoted to the turbine throat work; the laboratory's customers include airplane manufacturers, the USAF and Army Chemical Corps.

When the 10th turbine throat is available, it will operate over a Mach number range continuously variable from zero to 4.5. Model areas up to 5 ft will be handled in the new section.

Boeing Tunnel

Development of Boeing's turbine test tunnel started right after one year engineers got the wind tunnel NACA in 1946.

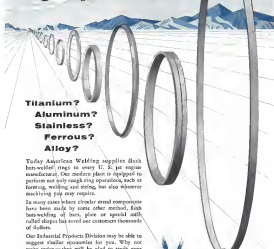
Today Boeing operates an 8-ft-11-in. tunnel with a ducted throat, and tests its airplanes and missiles from low speeds right through into the supersonic range at its flame test station.

Recently, under contract, the tunnel was a downwind section—the "Boeing flap"—to reduce power requirements for turbine operation.

At which point out of the slots at the throat enter a plenum chamber and must be returned efficiently to the throat stream again for real model power requirements. Boeing engineers developed recovery doors from turbine theory and located them just downstream of the test section. Thus are lapped at the aft end to vary the area available for re-entry and can be swung into the entrance to choke the throat.

The doors were selected as an alternate scheme to filler blocks, placed downstream of the test section and far-

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ing the actual air passage back into the tunnel keeps the planes. The Boeing boys proved to be the more efficient method of doing the job.

Boeing engineers credit their "little development" named a 1,200-mile model of the big thing—with being a great help during the Boeing fly evolution. The original slotted test section development, plus the conclusive two tests on the section doors were tested first in the small tunnel.

THRUST & DRAG

Indian Patent 27462 is held by a Mr. Mitra, the chief commercial engineer for Hindustan Aircraft Ltd. Mitra received the patent in 1940, which was rather early in the game to be thinking about VTOL aircraft.

But that's what he had been doing. Mitra's drawings show an open-ended, straight wing airplane with control props, cruciform tail surfaces and an adjustable pilot's seat. He proposed sliding weights to shift the center of gravity and thus change the trim for vertical and horizontal flight.



The patent sets the primary object of the design is to enable vertical take-off without landing, and landing with little landing, depending on the relative wind strength. Another object, says the patent, is to enable an airplane to hover.

Vince Brown's Bushy Brownson claims 12 mph faster than anybody else's. Brownson, former Adverserch stock owner (produced on the way according to last week's AW (p. 55)).

The idea was that economical production great wing panels which are a little asymmetrical, left and right, and are not due to the original wing section is liberally developed by appropriate French cover.

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aircraft and smoothed out the wing. Now nobody but nobody is slower than Brownson.

Would anybody care to try the next thing as a jet aircraft to see if it helps ease wing drop at high subsonic speeds?

Common efforts are continuing made to improve relations between military aviation test pilots and the industry that produces airplanes.

In Britain, Air Commodore A. H. Wheeler, air officer commanding the Aeroplane and Jet-engine Experimental Establishment at Boscombe Down, said recently that his pilots were being encouraged to foster the spirit of goodwill

and smooth working. As an example, he cited the recording of one pilot's report which originally said "The airplane stalls without any warning at all and is dangerous."

The report was changed to read: "A more delicate stall warning would enable pilots to exploit fully the other more excellent characteristics of this aircraft."

And in a couple of years, there's sure to be a RAF pilot waiting for the more delicate stall warning that never comes. Meanwhile, over at the local at Boscombe, the AEE pilots are drawing habits in a spirit of goodwill and smooth working—DAA.

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WEST GERMANS CELEBRATE return of concept with flight of powered glider

Bonn Flies First Powered Plane

Bonn—Just one day after Germany had signed the surrender, the first German-made powered plane, named the Maize, was in the air at Bonn-Hangelar Airport. It was not yet powered and the motor testing was not completed, but German engineers felt they could not wait a day longer after having been forced into flying for 10 years.

It was possible to "hook" the plane in as short a time only because a previously constructed glider was used. The glider was converted into a proper cross aircraft rapidly by installing a 16 hp. Volkswagen engine.

The plane was financed and built by the Bonn firm Alfons Fieseler & Co., the Maize's glider designer Rudi, and a group of plane enthusiasts.

The aerodynamic design of the Doppeldecker glider, with its long, pointed, qualities, was left unchanged, and only the structure was adapted to the new requirements. The plane is a two-seater. Wingspan is 41 ft, wing

area is 194 sq ft, keeping the small engine in mind, the wing loading was kept extremely low. Cruising speed is 67 mph, maximum flying speed is 71 mph.

Since the plane is also designed for training purposes, a second set of rubber pulleys is installed. There is only one control stick, which can be operated by both occupants.

Alfons Fieseler, the manufacturer, says, "We have not yet figured the cost out of the first model plane but it is somewhere between 12,000 and 13,000 deutschemark (\$2,510 and \$2,100). If we get enough orders to start production on a large scale, we think we can reduce the cost to 10,000 deutschemark."

This, in addition to the extremely low operating cost of 5 deutschemark an hour, should be a strong incentive for the many plane enthusiasts in Germany and abroad for whom the other sports plane now offered by Fieseler seems too expensive.

Armour Flame-Sprays Ceramic Coatings

A method of flame-spraying aluminum oxide and zirconium oxide oxides on an actual surface for high temperature protection has been developed by Armour Research Corporation of Illinois Institute of Technology, Chicago.

The technique, which appears to be similar to one developed by Ruston Aircraft Co. (AW, Apr. 25, 1955, p. 18), permits the ceramic coating to be laid on by flame gas without actually heating the metal base. The coating has good temperature and chemical stability. In many cases, the underlying metal can be melted without causing failure of the coating, according to Samuel W. Bodofsky, of the foundation's ceramics and several research departments.

Bodofsky says the ceramic coating is harder than tool steel and is unusually adherent in thickness up to 10 mils. He sees it as offering protection against radioactive erosion at steel and aluminum rocket nozzles. Its development may help protect rocket nozzles, such as aluminum, ductile alloys and weld metals against erosion and abrasion on pump nozzles, jet blades and tailpipes, and piping that is subject to oxidation.

Since it is poorly suited to extreme molten metal, it may be used as a permanent mold coating for aluminum casting.

The method may be even better, Bodofsky reports, because it is more selective and chemically inert than others.

The flame spray ceramic coatings have a residual porosity of about 10-15%, cutting down on the protection

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then often against chemical elements.
However, according with ARI-developed
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The foundation has received Con-
tinental Casting Corp. of Illinois,
2351 S. Michigan Ave., Chicago for
use of ARI process covering the tech-
nique.

The Ryan development utilized a
model open-casting gun converted for
basic pouring. Section was reported
in developing a nickel-chromium cor-
rosion shield steel and found. Four
valves controlled operation of the gun
—one each for the corner powder, oxy-
gen, acetylene and the nitrogen which
regulated the corner. Temperatures of
5,900° were created at the gun.

Rotorcraft History, Handbook Set Issued

An 18-volume set of rotary-wing air-
craft handbooks and history is being
published and distributed by the U. S.
Dept. of Commerce. It was prepared
for the Air Force by the Hewitt Air-
craft Co. and edited by Eugene K.
Liberator, now with Fletcher Aircraft
Corp.

The volumes are reclassified and
will be available to the general public.
Copies of Volumes 6, 7, 13 and 14 are
now available at a price of \$2.00 each.
Orders should be sent to the U. S.
Department of Commerce, Office of
Technical Services, Washington, 25,
D. C., with check or money order made
payable to the Director of the United
States.

Abstracts are presented below:

Volume 1, History of the helicopter to
the year 1958, by Eugene K. Liberator.

Volume 2, Helicopter development, 1950
1958, by Eugene K. Liberator.

Volume 3, Helicopter development,
1959-1959, U.S.A., by Eugene K. Libera-
tor.

Volume 4, Helicopter development, 1959
1959 foreign, by Eugene K. Liberator.

Volume 5, Wright and Liberator, by
Eugene K. Liberator.

Volume 6, Aerodynamics and perfor-
mance of helicopters, by Alexander Klemm
and Igor A. Skobly.

Volume 7, Helicopter handbook for heli-
copter, by Robert V. Wagner.

Volume 8, Mechanical design and de-
scriptions, by Henry S. Campbell.

Volume 9, Rotar blade handbook, by
Eugene K. Liberator.

Volume 10, Stability and control of
rotary-wing aircraft, by William E. Cober.

Volume 11, Special types of rotary-wing
aircraft, by Eugene K. Liberator.

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low fuel consumption

Specific fuel consumption of the Napier Eland
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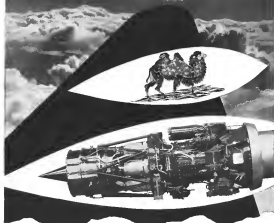
a base of standard—single lower section, with manual

control, gear, shaft, rotor, propeller and main shaft.

a standard—propeller, propeller

At the low altitude the Eland has recently passed a 100-hour test

test performed in the full 1,000 c.h.p. rating.



NAPIER Eland turbo-prop

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NEW TANKERS GIVE JET

Boeing and Lockheed Receive Awards in Air Force Tanker Competition

Intercontinental range for high-speed jet bombers and fighters will be assured by new jet-powered tanker-transports, the result of a major industry-wide competition.

These tanker-transports are Boeing Airplane Company's KC-135, which has been ordered into production, and a new Lockheed Aircraft Corporation tanker on which design and development engineering has been authorized. The Boeing

tanker-transport was designed around four Pratt & Whitney Aircraft J-57 turbojet engines.

With efficient, high-thrust engines, these modern tanker-transports will be able to deliver tremendous fuel loads to big jet bombers and fighters flying at combat speeds and altitudes. They will be practical—and essential—additions to America's air strength, giving global "reach" to her combat aircraft wherever they must fly.



GLOBAL "REACH" for jet bombers like Boeing B-45s and B-47s, and for long-range escort fighters such as McDonnell's F-101, will be assured by a new generation of tanker-transports. The first will be Boeing's KC-135, winner of a major industry competition. It will be powered by Pratt & Whitney Aircraft turbojet engines.



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BOMBERS GLOBAL "REACH"



NEW JET TANKERS ordered into production are Boeing KC-135s. They will be similar in appearance to the sleek and modern tanker-transport prototype, the Boeing T-97. Four advanced Pratt & Whitney Aircraft J-57s, shown at right, will power them. Refueling tanks can be removed quickly when the aircraft are needed for other cargo missions. Production and operation of the new aircraft will be of major significance throughout American aviation.



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individual. Instructions concern us only, including lessons in advanced management at leading universities, jobs are created.

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Many engineers complain that the shortage of trained engineers is more apparent than real, that efficient use of engineers in the jobs they are fitted for could wipe out this "shortage".

Industry engineers point out, however, that use of engineers is not a problem that can be set up on a slide rule, with everybody accepting the resulting solution as the answer. There is bound to be a measure of inefficiency in this.

Within the context of this inefficiency, they see suggestions such as those made by Muller as leading to an improvement of the situation.

Alcoa Develops Alloys To Take High Heats

A new aluminum alloy, with "cast test properties" as the 508-600F test positive says has been developed by Aluminum Company of America.

The company also reports that it is developing another aluminum alloy, for the 508-600F range, for structural use in aerospace aircraft. Sixteen inches encountered at speeds of over 1,500 mph, generates intense heat that compares strength of some aluminum alloys, Alcoa point out. This has become an increasingly serious problem in aircraft design.

Alcoa's 508-600F alloy, designated X2215, is now available in eight standard quantities in the 4½ condition produced by a solution heat treatment and water quench followed by an artificial aging treatment. The company suggests its use for jet and piston engine structural applications and various parts that are loaded due to the engine.

Some of the mechanical properties of X2215-T6 (properties of Alcoa 2215-T6), a standard forging alloy, are as follows:

- Tensile strength—5,800 psi at 500F, 25,800 psi (11,000), at 600F, 15,000 psi (5,000)
- Yield strength—500F, 21,000 psi (9,000 psi) at 600F, 14,000 psi (7,500)
- Elongation—500F, 14% (50%), at 600F, 20% (75%)

Notes the quarter inch standard thickness figures for X2215-T6's room temperature properties. Tensile strength, 55,000 psi, yield strength, 18,000 psi, elongation in 4D, 8%.



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Automatic Electrolytic Shipping with Electronic Control gives cost savings of standard gauges filled with miniature equipment. **Arvest Engineering Co.**, 512 W. Washington Blvd., Chicago 6, Ill. **Damping Devices—Patt.** Patent, Patux, includes lead-velocity charts for measuring performance. **Cabnet Co.**, Dept. 10, 1148 Euclid Ave., Cleveland 15, Ohio.

Dip tank and flow-out casting facilities, giving advantages at each method. **La. Pac. Foundry Division**, E. I. du Pont de Nemours & Co., Box 71947D, Wilmington 98, Del. **Vibration, shock and noise control products**, including selector chart covering wide range of equipment. **Korlund Co.**, Long Island City, N. Y. **Processes and non-ferrous permanent mold castings**, including analysis of various casting processes. **3-Mold Division**, Bakers Road & Manufacturing Co., 671 N. Main St., Mansfield, Ohio.

Mobile mobile air conditioning, designed for trailers, trailers, also applicable to fixed installations. **Elli & Watts Products, Inc.**, P.O. Box 75, Cincinnati 36, Ohio. **Valve Venturi Data** covers standard steel stems. **Public Relations Division**, Cooper Alloy Corp., Hialeah N. Y. **Commercial (R)**, a welding process using constant speed to give surface variations of 125 micro.

High-velocity spray technique for cleaning precision parts such as low torque instrument bearings. **Colidon, Inc.**, Patux Ave., Caldwell, N. J. **Over 1,000 sizes of down metal bolts** for use as studs and bearings for prototype electronic and vacuum equipment. **1955 catalog**, Zero Manufacturing Co., P.O. Box 1093, Burbank, Calif. **Station between Resistor PFA**, All-metal Screw Products Co., Inc., 521 Stewart Ave., Garden City, L. I.

Facilities for continuous pressure using machine products, **Reichert, Brosius, Inc.**, General Office, 22nd Ave. & Church Road, Roseland, N. J. **Kiloflex carbide hole drilling bits** for diameters of 0.3 in. and up. **Patt. & Whelan Division**, Miles-Brennan Prod. Co., W. Hartford 3, Conn. **Thermocouple assemblies and packing glands**, **Cating 1542**, Green Corp., 2811 Sheridan Drive, Buffalo 21, N. Y.

Four bit for 58-A strain gages, instruments, accessories and controls. **Baldwin-Loss Hamilton Corp.**, Philadelphia 42, Pa. **Industrial electrical standard and special plugs and receptacles**, **Balkeco 1579**, for Manufacturing Co., 5135 Glenview Ave., St. Louis 16, Mo. **Naval MC 80 ballistic gun design details and application on light-weight X-ray units for laboratory and industrial use**, **Spartan Gyroscopic Displays X-Ray for Development Facilities**.



Hi-Per DC-3 Overcomes Altitude Factor

Here is a **Per American-Cessna Airways Hi-Per DC-3** (Aviation Week Nov. 3, 1954 p. 70), of La. Pac. Beverly, listed as the world's highest commercial airport (altitude 13,694 ft.). This modified version of the DC-3 can cruise approximately 74 mph faster than a standard version because DC-4 P-WW 121500 powerplants replace an P-WW 121500. This modification and others also give the plane better climb, cruise, high-altitude and high-velocity performance. Advantages are particularly desirable when operating from fields located at high altitudes, such as that of La. Pac.



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Roaming nuts, bolts, cap screws and other types of fasteners, case histories of use, Form 5206-A. Ingersoll Rand Co., 11 Broadway, New York 4 N.Y.

Opportunities Through Automation, particularly for small plants. By Cell O Corp., Detroit 12, Mich. 36 new, second series covers completely line of sheet and plate working machines. F. C. Killebrew, American Publishers Co., Inc.

2157 N. Sheffield Ave., Chicago 14, Ill. **Automatic Precision Coatings**, booklet describing techniques developed for lost wax method, Advertising Dept., Crumline Steel Co. of America, P.O. Box 55, Pittsburgh 20, Pa.

50-Knot Silicone paint stated capable of taking 1500-lb. load and weather on towers is described in folder, C. B. Drayton Co., Inc., 2515 Clark, 583 Bk., P. O. Box 5092-L, Dallas, Tex. Scientific research and development facilities of firm are described in brochure, Transal Laboratories, Inc., 4101-4107 New Tigris St., Los Angeles 65, Calif.

Publications Received

• **The Army Air Force in World War II: Men and Plans**. Volume VI—Edited by W. B. Criss and J. L. Gutz-Pub by the United States of America, 1960. 130 pp., Chicago 17, Ill. \$4.50, soft pp. Concerned with activities of the Army Air Force in the Zone of the Interior this volume provides a record of development of an effective organization, training, and distribution of weapons and equipment and training.

• **Flight Handbook**, Fifth Edition—Edited by Murray A. Smith—Pub by Macmillan Co. Library, Inc., 11 East 40th St., New York 17, N.Y. 56.00, 352 pp. New edition, revision and enlarged presents basic information on airplanes, engines, and associated aviation subjects.

• **Wire Diagrams for Nondelay Film in Ducts**—By George Raskin—Pub by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N.Y. 10001, 278 pp. Contains measuring procedures covering problems of miniature film, microchannel tubes, and distributed samples and methods for wire diagrams.

• **The Chemical Industry Facts Book**, Second Edition—Pub by Manufacturing Chemists Assn., Inc., Office Building, 1425 K St., N.W., Washington 5, D.C. \$2.00, single copy. Diagrams available on both quantities 160 pp. Also reference source on the chemical industry and its activities.

• **U. S. Marine Corps Operations in Korea: The Purple Perimeter**—By Louis Morton and Capt. Nicholas A. Canzano, USMC—Pub. by U. S. Marine Corps for sale by U. S. Government Printing Office, Washington 25, D.C. \$2.50, 771 pp. First of four volumes on Marine participation in the Korean conflict.

• **Handbook of Moths & Butterflies** and **A New Synonymy of Pterodon** and **A New Synonymy of Pterodon**—Pub by Frederick Conkey Ford, Inc., 310 West 42nd St., New York 36, N.Y. \$10.00, 1164 pp. Includes some on pest insects; present status and future possibilities of the American economic insects. It is revised version of the original work published in 1947.

• **Gas Turbine Series, Vol. 1—Cycles and Performance**—Edited by James E. Drake—Pub by McGraw-Hill, Inc., 1221 Ave. of the Americas, New York 10, N.Y. \$9.00, 379 pp. Series is designed to present a concise, informal account of recent trends and practices concerning the gas turbine.

• **Gas Turbines for Aircraft**—By Tom H. Drayton and Chas. E. Lawrence—Pub by McGraw-Hill, Inc., 1221 Ave. of the Americas, New York 10, N.Y. \$10.00, 364 pp. Performance volume for those concerned with design and performance of gas turbine powerplants.

• **1954 Supplement to the Metal Choosing Bibliography Abstracts**—Prepared by J. C. Harris—Pub by the American Society for Testing Materials, 1915 Race St., Philadelphia 3, Pa. \$1.50, 49 pp. There are 127 new references in this booklet which brings up to date coverage of the published data on metal choosing.

• **Plastics Tooling**—By Malcolm W. Ralston—Pub by Reinhold Book Corp., Reinhold Publishing Corp., 415 Park St., New York 17, N.Y. \$7.50, 125 pp. Report on the status and methods used and the major applications of plastics tooling.



Crash Program

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Progressively more severe drops were made until the Navy requirement was met, and passed. Higher drops of the airplane continued without significant damage. The above photograph shows the 188th drop that successfully imposed loads 74% greater than the Navy specifications, and without significant failure. This is another demonstration of the "Flat Factor" possessed by Beechcrafts and readied to their owners, as better service and decreased cost of upkeep.



The Beechcraft T-38B is now in production for the U. S. Navy, U. S. Air Force, and the military services of Canada, Chile, Colombia, El Salvador, Japan.

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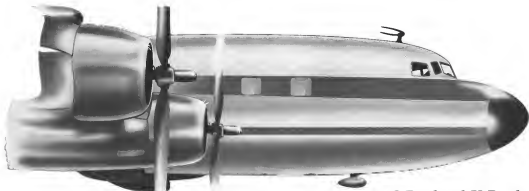
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PRODUCTION

Casting Gives Way To Sheet Metal In Some Aircraft Applications

By George L. Christian

Dear Paul, N. Y.—A progress to save weight of aircraft components by substituting sheet metal parts for castings wherever possible is being spearheaded by Skyline Products, Inc., Inc., Englewood, with USAF's overall weight reduction effort.

Skyline technicians are specialists in manufacturing precision sheet metal machine components, with emphasis on seam welding techniques. They call themselves "tin knackers."

First Skyline variants in the area is substituting tin for a casting in a valve for an unpowered pump in an oil conditioning system. William Jung, company president, told Aviation Week that by making the assembly out of Type 304 stainless steel (upper and lower halves welded together) instead of casting it out of aluminum, save 1.1 lb., cutting weight from 3.8 lb. to 2.7 lb.

Two critical benefits result from using sheet metal:

- Expansion rate is appreciably reduced. Reason, Skyline says, is that the structure cannot warp where a machining operation—such as turn or perforation on a casting—usually a final fix, so the machining job itself is accurately done, resulting in scrapping the whole part.
 - Heat resistance of stainless steel is much higher than that of aluminum.
- Proof of stainless steel is coming in directly comparable, according to company officials.

Growing Trend

According to Jung, substitution of sheet for castings is a growing trend which will soon spread to other aircraft components where such change-over is feasible.

Another trend at Skyline towards producing lighter, more serviceable aircraft equipment is the use of a thin aluminum sheet and fuselage plate sandwiched between two thin light, yet rigid, aircraft components.

Jung cites three two examples where such construction proved to be superior to previously used methods.

First, old Cessna uses an 8x16-in. cast-aluminum plate made of solid 1-in. thick castings. Skyline turned out an identical plate made of two 1/16-in. sheets of aluminum, sandwiching a piece of Lockheed to give the structure the same 1-in. total thickness.

Second, a plate of equal rigidity, but much lighter.

Amesbury Airlines was having trouble with roll moments used on its DC-6-type airplanes. Original variants were made up of steel and aluminum. Skyline used with lower fiberglass construction. When the variants were washed, water often seeped into the fiberglass, making the walls heavy and causing them to exert a drag-like effect on the whole aircraft.

Skyline is making the structure with steel and outer aluminum sheet structure. These are joined by the conventional butt joint and the reinforcing space filled with Lockdown. Result is a very rigid structure with a filler which is superior to steel, provides excellent reinforcing properties and is not hampered by the impurities in which the former operates.

Lighter bearing elements are used in the walls. Two thousandths less the rest of the desired transparent seal can easily be made.

Jung says he will adopt this sandwich technique to the manufacture of other necessary items, such as hot and

cold liquid containers.

One of the Skyline firm's specialties is seam welding. Welding. This technique is particularly applicable and not too well known used to fabricate tanks of all kinds—water tanks for aircraft, and fuel tanks for boats in the Civil Craft in private craft use. The construction of seams welding and Metal is steel, tungsten. Seams welding gets the job done at the lowest possible cost, which using Maser tanks provides a structure which is virtually unassailable. Jung says he has developed seam welding techniques of his own which permit him to weld constantly larger in size structures with ease, resulting in a virtually low cost.

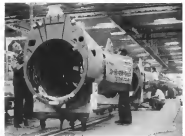
Jung is also experimenting with a stainless steel fast tank for the Pope John, to replace the standard steel tank currently used.

Imagination

Small plants that are lacking in large financial resources often have to fall back on ingenious ways of getting things done to avoid large investments in costly equipment.

Here is an example of how Skyline improvised a good-size drop hammer at a fraction of the cost of buying such a machine.

Jung was a contract to manufacture metal cases for Republic Aircraft's



Assembly Conveyor Speeds F-84F Production

At further action for USAF's Republic F-84F Thunderstreak, produced by Texas Air Craft Co., under contract, now due in the assembly line at a key speed rate of 100 per hour as shown on the Delta conveyor is a drop hammer. Texas expects this 300-ton structure to simplify and speed production of the fighter-bomber units. Each oval-shaped variable tank is moved by a three-quarter horsepower electric motor, the gear ratio on one of Texas' production machines is 70:100:1000 and 100:100:1000 on the second belt.

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F4H. The job required a drop hammer capable of handling a 100-lb, 21-in. male die. Jang did not have a drop hammer, but he thought he could improvise the job locally. Investigation showed that he could not. So he bought two gas-type rams by double lifts and set them in eight feet of concrete in his new plant base. Hydraulic action was too slow for drop hammer operation so the two lifts were converted to pneumatic action.

The male die was attached to a rock passing the two pistons. The female die was placed on an alignment platform under the male die and secured in place. The top-section 4-ft drop provided by the pneumatic cylinders worked out fine.

To square every bit of shank on all his machines, Jang and his technicians fastened stretch straps to the concrete bed so that, with hydraulic assistance, it became a stretch press.

Stewart's do-it-yourself technicians also built a slitting wheel chamber out of 30-in. dia. corrugated piping bowls. Unit accommodates two rubber gloves to allow welder to work within the chamber a work window and an observation window. Chamber is mounted on a base which permits it to be positioned in any way the operator desires.



More Bad News for Subs

Four Lockheed P-3V attack Neptune are close to being completed at Burbank, Calif. Now straight line production system is used to save four man-hours of moving time per plane, compared with previous awkward manual alignment. To the right of the 400-ft. hull line (and not shown in the picture) is fast assembly line for Neptune's attack trimaster, the roller support, Super Crusier. Crusier's four electric line spin units (bottom, right) also helps save production man-hours. Rolling measures 500x100 ft.

to drums. It is charged with super because of its ability to weld in position during welding.

Among other machine activities at Skylark are manufacture of engine rollers for American Airlines, Pan American World Airways and American Airlines CO Co's DC-600 aircraft, and repair and overhauling various aircraft for the Air Force and Colonial Airlines.

Jang is also starting on motor and ADI head cast for PAA and AA. The casts will be fitted with Flyer Cob bakker and standard 6000° wheels, large enough to cope with snow and drop rate.

In the plant metal line, the company is manufacturing many parts for a States water separator and a water separator for a States pressure regulator. Jang has almost completed setting up an electronic laboratory, where he intends to develop and manufacture electronic subassemblies.

In a new preliminary work on stage in a small workshop, which will operate on the pulsed principle.

In the metal field, Jang is putting out a wide line of Metal hardware, such as mounting bolts and clamps, plus the Metal fast fasteners.

The Skylark Products organization was born with the dissolution of Amer-

NOW

...rated at 500°F!

Another advance in lightweight
flexible hose assemblies

~100°F to +500°F RANGE
NON AGING
ENTIRELY UNFFECTED BY AIR FLUIDS
TIGHTEST/PROOF COMPRESSION FITTINGS

Constant hose development work at Resistoflex has paid off again. Service experience has permitted an improvement in temperature rating of Fluoroflex® T R-300 hose... the first aircraft hose to use Teflon®... the first to warrant a 500°F rating at 1000 psi (750 psi in the larger sizes).

Made with Fluoroflex-T (Teflon-compound) tube, BAE 264 stainless steel reinforcing braid and blowout-proof compression fittings, the lines offer permanent plumbing... no swelling, no erosion, no aging. Their flexibility stays the same throughout the temperature range. Fluoroflex-T R-300 hose assemblies are A-N approved for use with synthetic oils, fuels, and fuming nitric acid.

Bulletin FHS-2 gives detailed data... send for your copy to RESISTOFLEX Corporation, Belleville 9, N. J.

*Fluoroflex is a registered trademark used for products from Fluorocarbon. Teflon is the DuPont registered trade mark for its tetrafluoroethylene resin.



Resistoflex also manufactures other specialized products for the aerospace industry made from Teflon, Kel-F and Fluorocarbon... such as rail, sheet, tube, pipe, electrical sleeving, spiral lock-up rings.

RESISTOFLEX

CORPORATION
Belleville 9, N. J.
West Coast Plant: Burbank, Calif.

on Rapid Action. Jiang and three other employees moved into an 805-ft. store in Jamaica near La Guardia, and launched the new venture with \$500 cash. That was 1971, 1 years ago.

Today, at Deer Park, a new 15,800-sq-ft addition to a 1961 one-old, 11,800-sq-ft plant is nearing completion.

Equipment is not under 100, all of online people. Youth also has been tapped 51 on-line, according to Jiang, but this year should reach approximately 511 on-line.

PRODUCTION BRIEFING

► **Bethcon Manufacturing Co.,** Wal-
den, Minn., has purchased a 200-
600-sq-ft plant in Tredahaus and
South Lonsell, which it had been les-
sing since 1972. The electronic manu-
facturing facility occupies approximately
700.

► **Continental Aviation & Engineering**
Corp. expects to have some 600 em-
ployees working on 350 airplanes, built
under license from Embraer, by year's
end in USAF-owned facilities at
Toledo.

► **Aerospac Corp.,** Jackson, Mich., has
purchased a recently completed 30,000-
sq-ft plant in Tazewell, Ill., for new
Canadian subsidiary.

► **Comac Aircraft Co.,** Wichita, Kan., has
received a \$5-million contract for 2-48F
horizontal stabilizers from Republic
Aircraft Corp.

► **W. C. Truett Industries, Inc.,** Brent,
Ind., is under a \$1.5-million contract, as
adding approximately 23,000 sq ft to
production facilities.

► **Photo process plate manufacturers** on
valves, thrust chambers and other parts



VACUUM CORRECTS DIMS quickly to
original smooth contours, using portable
equipment owned at Glass L. Meier Co.,
Baltimore, Md. Here a wingtip that took
undergoing roughening. A plate fused to
the tank's exterior, is placed over the dim
and sealed with a sponge rubber gasket.
Vacuum is applied by two-stage pump. Com-
pact size of this semi-defensive normal con-
tingency is often corrected by this method.

erly by Aermet-Cumet Corp., Ames,
Calif., aircraft need to meet plates in
parts.

► **Avacible Products Inc.,** Cincinnati,
Ohio, maker of water skis, plans to
have a new subsidiary, Avacible Prod-
ucts of California, producing near
Desert Hot Springs this summer.

► **Acme Industrial Co.,** Chicago, Ill.,
maker of tool steel standards and
machine shop sets, has announced a
15,000-sq-ft acquisition to provide in-
creased working area.

► **Safety Tool Division, Amper Metal**
Inc., Milwaukee, Wis., has appointed
Aviation Supply Co. as distributor for
its spring-loading hand tools for

Kanzen G. Moser and Ogden,
Utah. Congress has named Amper
Corp. as representative in London,
N.Y., for these items. General Dith-
wing Co., Great Falls, Mont., is its
agent for the Aspen Weld line.

► **Sandstrand Machine Tool Co.,** Wash-
field, Ill., started construction of a 55
million plant near Denver, Colo., to
make jet aircraft constant-speed drive
mechanisms. Plant is expected to begin
operation in November.

► **Garrett Corporation of Los Angeles**
is erecting new 52.5 million admin-
istrative and engineering office building
at its Aerospace Manufacturing Divi-
sion plant adjacent to Los Angeles In-
ternational Airport.

► **Avcon, Inc.,** Woodside, N.Y., maker
of plane maintenance and control sys-
tems, is adding 11,800 sq ft to its
engineering and administration facil-
ties.

USAF Contracts

Following is a list of recent USAF
contracts announced by AFMC.

Advanced Warfare & Mfg. Co., Winston
Salem, N.C., electronic processing data 145
40, 125-400.

John Instrument Co., Cleveland 2, Ohio
John Instrument 1910-1-14, 145-145, 145-
145-145.

Advanced Warfare & Mfg. Co., Winston
Salem, N.C., electronic data 145-145, 145-
145-145.

Advanced Warfare & Mfg. Co., Winston
Salem, N.C., electronic data 145-145, 145-
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Advanced Warfare & Mfg. Co., Winston
Salem, N.C., electronic data 145-145, 145-
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Advanced Warfare & Mfg. Co., Winston
Salem, N.C., electronic data 145-145, 145-
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Salem, N.C., electronic data 145-145, 145-
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Advanced Warfare & Mfg. Co., Winston
Salem, N.C., electronic data 145-145, 145-
145-145.



Shown here is a giant step
toward tomorrow.

Conceived and developed
by a team of Martin people
who have been working with
Navy scientists since 1950,

Viking 12 is the latest of a series of
high altitude research vehicles.

It was designed to explore the
problems of controlled flight
in the near-vacuum conditions
of the outer atmosphere and
at speeds in excess of 6,000 mph.

In this long-range Viking program,
technical problems are
continuously being solved
which support advancements that
are now being made toward the next
frontier of flight—manned lunar
intercontinental range.

and beyond that lies space itself



MARTIN
BALTIMORE · MARYLAND



Northrop Does It With Mirrors

Four mirrors, precisely
ground and aligned, are the
optical heart of a new radar
system being built for
USAF by Northrop Aircraft's
Aurora, Calif. division. The
company's interest in optics goes
back to the start of its
South-gated missile program,
because of the advanced opti-
cal techniques used in per-
spective navigation systems.
Northrop has a complete opti-
cal processing center for pro-
ducing mirrors, precise glass
components.

COMING RIGHT UP



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The right heater—the right accessories—the right system for your business aircraft.

Pick it from Janitrol's complete line, the heater line that is engineered . . . thought out . . . engineered to create combinations of heating units, components, and accessories for dependable systems in all types of business aircraft—from the smallest to the largest. Performance proved since 1942. Dependence of these heaters, or their counterparts, have tallied millions of operational hours in civil, commercial, and military aircraft of all sizes all over the world.

Output of from 25,000 to 200,000 Btu/hr in single units—to more than a million Btu/hr in multiple units.

Compact, simple, interchangeable, easy to install—check with your local modification center or your nearest Janitrol office.

Backed by 30 years of experience in combustion engineering



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LETTERS

Engineers on Shortage

The letter from W. H. Mord and his associates in the "Engineer Shortage" (AW May 5, p. 37) are appreciated. It was about time somebody interpreted the chaos of articles claiming shortage of engineering manpower all over the technical world.

Every author of these classroom articles points out some plausible reasons to predict such shortages except this *is* not. Because they are selling the birds, but fail to run out their engineering toolkits.

Problem Is Solution

The trouble is that in America there is not a shortage of engineers, rather it could be said that there are enough to supply all customers of selected and employed artificial profits.

A lot of graduate engineers of American colleges remain laid idle at all and the others, if they find work, find it out of their specialization.

In the industries to cover themselves, state that these engineers have not had enough experience. The reason that there is not a shortage of engineers, but only of capable engineers to guide and train those engineers.

Noting that there is a shortage of engineers, what are the industries doing to alleviate this shortage? Nothing! Only, a lot of blame and words which mean nothing, but set a trap in order to solve the problem.

Everybody calls loudly for the "open," but nobody wants and prepares the ways to direct spend it. Then, why all these articles with warnings to the industries? When in the purpose of this article, if nothing will be done. Why blame the men on the shortage of people in engineering fields when the industries do not require more professionally trained skilled men.

Some requests are made from the several industries, but with the privilege to choose the engineers left of engineering schools, and with right to 14 years or more of experience. Now you can laugh at the shortage & the doing justice to engineering education. As far as we know, the industry only give to the students a full background of the engineering knowledge they choose, but never the required experience.

If the industries do not wish to train the junior engineers, so they wish them, then perhaps they should build electronic robots or computers. This will eliminate the need for the human brain in engineering practice.

It is known that in this country there are many engineering people looking for guidance to put them into the proper place in the field, then, the industries could direct them where they are needed most. In addition to graduate engineers in American colleges, there are many engineers with design licenses that live in America. Most of these people do everything except the work they are specialized in.

If the industries were to give more con-

"SECURITY" ON PATROL



Lockheed
P2V NEPTUNE

The U. S. Navy's first line of air-sea defense—there's the new P2V Neptune multi-mission patrol bomber. Two jets plus turbo-compound engines give extra speed when needed . . . special apparatus spots subs deep under the sea. Its many uses for patrol, for attack, for manning all sorts "security" for America's coastline.

Camloc latches and quarter-turn fasteners "secure" cowling and access panels on the additional jet pods.



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Put yourself where the great things are happening in propulsion system development. Right now, Fairchild wants experienced, capable men in these fields:

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Aerodynamics
Thermodynamics
Stress analysis



Write to me today: Felix Gardner
Fairchild Engine Division, Farmingdale, L. I.



FAIRCHILD ENGINE DIVISION
Engine Division
FARMINGDALE (LONG BEACH) NEW YORK

"solve the future in measured in life-time"

LETTERS

colleagues to these people they could help the so-called shortage and as the resources, the industries could have themselves a truly engineering group who are well trained in the entire system.

The problem of shortage in engineering fields can only be solved if someone would only take an interest in helping to discover the actual facts and reasons for such a shortage.

The end truth might be that such a problem does not exist and even though there might be such a shortage, it is possible that the so-called "shortage" is the very setting field "taken from other sources."

Training in Specialties

It is useless to cry out about the shortage of manpower and it is not helping to take the road for an increase of engineering students because these new engineers will not be trained in their field, as it is in the fields because of time lack of experience.

So the problem is not solved but only postponed because the industries are not allowing shortage for the simple reason that they want well-trained people with considerable experience and not "freshies."

The problem is not "quantity," but actually "quality," and to supply this quality it is absolutely necessary to have the young engineers with pre-arranged training courses relative to their own specializations. The teachers shall be the oldest engineers of the industry with pertinent positions representing a broader field will give to the young engineers the best skills.

At the end of the training course, a sort of examinations shall be given to the "trainees" engineers in order to establish their professional attitude and education, as is in better some industry's needs.

I believe that the combination of such training courses in the appropriate curriculum in numerous special with all the industries in that field, will give you the solution to the shortage and quality of the new person.

Simply and clearly, I would like to say that the present opinion among the industries on the shortage of engineers is as very different.

Every body of an engineering group applies his own method to solve his engineering shortage. No coordination exists among the different bodies of the industries and nobody is really interested in what they are looking for, nobody really find the real solution and this is due to the competition between bodies of the industry. This is a serious condition.

In a graduate of a foreign college is considered engineering with several years of design experience, and is a master of technical work. I would like to reply to the American industries the Latin phrase: *Concedit non potest tamen defendere ab eo remaneat debitor.*

CHASCO DEBARRON
61 Fourth St.
Waltham, N. Y.

(Finally, this is what Russia believes about, 50-50 as stated in *Radio DeWright* on the issue of engineers, and to an Agreement helps such things



Robert J. Wood, Director of Research and Development, Ford Motor Co.



J. M. S. Wood, Director of Research and Development, Ford Motor Co.



J. M. S. Wood, Director of Research and Development, Ford Motor Co.



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GUILLOTINE GAGE

- assembled from stock components
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- choice in 10 features
- maintains original accuracy
- lower original cost
- less down-time
- quickly reworked for parts changes

Already in use by the leaders of the jet engine industry this new kind of guillotine gage solves the problem of measuring accuracy. Thin plates are supported over a much larger area of their surface, making wear negligible. And adjustment is guaranteed by heavy slotted towers that are bolted together for rigidity and complete rigidity. Winslow's new design and assembly from precision tool-and-die shops yields perfect leveling advantages. You get quick delivery and lower original cost. You save an extraordinary amount of change substitution of some parts can be made without even removing the gage from your inspection line. Gage down time is cut requiring fewer gages and avoiding costly production holdups. And finally, you reduce your gage investment with a truly multi-purpose instrument—check all 10 features of a jet engine blade with a single gage, check forging and finished parts with only one gage. No more gage obsolescence—Winslow's Jet Work Service quickly adjusts the gage when your part changes. Easy to use and easy to read, the Winslow speaks production, gives "more accuracy for less money." Write to Winslow, get the full story on Winslow standard and special gages. For every precision control problem.

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first name in precision control

• LETTERS

present second issue into the product design its destruction...[E]

Your recent collection of letters on the "Engineering Disaster" effectively reflected the widespread view of our readers.

It also represents the first time when we know that a magazine has ever been devoted to that topic, subject other than the usual canned matter of occasional fires, and I feel compelled to add a few of our own observations.

First of all it cannot be denied that most accidents are being caused by factors other than our failure, but the percentage is small in relation to years of experience has become a useful tool.

In brief, there are considerable few in design considerations that are being exposed at a rate that is commensurate with their experience. All this is much to the credit of the "old timers" who have not moved into machine problems and feel themselves threatened by replacement with young, recent grads.

Not only thousands of engineers have left the profession for better paying positions in administration, sales, finance and a whole lot of non-engineering business.

I feel certain that these men would not have left, if there could have been the recognition and professional status now shown in your job.

WALTER T. GOSWAMI
1511 Bridge St.
Dundee, Ill., Pa.

Control for Platform

The Hiller Scout has flying machine pointed on page 4 of the April 22 issue appears to not have remote possibilities, but a lack of an very control system, not a good control system, especially considering the high order of quality.

With a good control system, the machine can be increased to a useful size with the pilot sitting down in a bubble-enclosed cockpit and the joystick placed below the feet. The first step is required, and can be based out on the ability to the shape of the popular idea of a "flying tractor" increasing it for forward motion.

For a good forward and pitch control, shoulder flaps, hinged at the top, are hinged out from the inside of the sheet along where the fore blade tips, rotating all part of the entire air supply on one side and then coming back to its which will tilt the vehicle.

Almost angle of these control flaps around the most circumference of the wing could be connected by control cables to a single control stick which could be turned by the direction to move the only to tilt in that direction. Additional power would have to be applied to maintain altitude when the machine is tilted and hovering horizontally. This idea is so simple and obvious that a thousand people have probably thought of it, but so far as I know no one has tried it and it seems to me that someone should give it a shot.

ROBERT B. ROSS
Anchorage, Alaska



experience

plays a vital role
in every success

Man's efforts to increase life expectancy comprise one of the noblest of all human endeavors. In this field it is significant that several men compare experiences when major surgery is indicated.

Since Meletron products are used by every major aircraft manufacturer, much has been gained from their experience. Reports of their experiences have enabled us to build pressure-actuated switches that are not only reliable, but exceed the requirements in the specifications.



Pressure-actuated switches for every requirement from auto starters to 1000 psi. Volume numbers are used by every major manufacturer of aircraft in the United States.



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NEW AVIATION PRODUCTS



Fast Stress Calculator

A three-axis calculator similar to a circular slide rule has been developed as an aid to the analysis of ductile materials.

True stress calculations normally are lengthy. They are based on determination of the reduced cross-sectional area of the structural member while it is under load, rather than on the original full area.

One manual movement of the new calculator gives true stress values opposite an applied load for a given size and material of the structural member. The calculator is applicable to rods with diameters between 0.1 and 0.5 in.

Research Services Co., Box 2492, Cleveland 12, Ohio.



Mobile Cargo Conveyor

A cargo conveyor unit mounted on a Frigidaire motor can load 34,600 lb/hr with belt speed of 75 fpm. Designated Skidboard ML-1, the conveyor assembly was designed and built by Redfern Kagle Smith Pty. Ltd. (Commonwealth), Melbourne, Australia. Initial orders for the conveyor unit placed by United Airways. More units will be ordered by South America.

Gala 10-ft. Thread Lengths

Thread lengths to 30 ft. can be ground in one setting with Style 120 machine designed to handle aircraft actuator screws and machine tool lead screws.

Automatic features include fast-tooth saw, grinding wheel dressing, suspension of grinding cycle after dressing, lock-link compensation, control of coolant flow, lubrication and retracting the grinding wheel end of the working cycle.

Ev-Cold-O-Corp., Detroit 32, Mich.



One Fuel Gauge Gives Two Displays

Single dash/dials fuel quantity indicators give both total and individual tank readings. Selection of total or single-tank gauge at pilot-controlled by means of a panel switch. Reading of one tank is obtained by actuating the panel selector.

During totalized reading, the pointer is automatically driven full scale and reversed to track to eliminate ambiguous readings. With the pointer within of the dial on operation, a dial "flag" indicates that a single tank is being gauged.

Indicator is heretofore sealed and meets all applicable MIL specs, the manufacturer states.

Aerco Inc., 48-15 Northern Boulevard, Woodside 77, N. Y.

Transmitter Covers 110-123 Mc.

New VIII transmitter, working 1 to 4 in., covers channels from 115 to 125 mc and features a uniform 3 to



4-watt power output on any channel. Uniformity is provided by continuous tuning action, whereby rotation of the channel selector switch also turns a geared apparatus controlling potentiometer peaking for three tuned circuits.

Frequency stability is reported at 0.01%, or better, on all crystal channels. Transmitter measures 1 1/2x3 1/2x1 1/2 in. and is adaptable with either hand or electrically operated remote channel selector.

Detroit Aviation Radio & Equipment Corp., Troy, Ohio.

ALSO ON THE MARKET

Meets service depth gaps of 5 and 6-in. capacity have 0.001-in. remedy. Standard pin can be replaced by hand-cut long straight pin for small duty holes—George Scherer Co., Inc., 230 Lafayette St., New York 12, N. Y.

Electronic Count-Off for Dremel 6. Shaper automatic machine accurately counts parts produced and gives visual and audible alarm when stock is exhausted — Count-Off-Less Co., 1271 W. North Ave., Chicago 22, Ill.

Wear-stopping induction generator, Two-Meter Model 35 WS, portable, ends of fused standard size to No. 36 gauge, on solid or non-fused wires the most common most plastic insulations in the shipping wire, the meter reports. Device also converts far into ohmic resistance, indicating or less — Induction Testing Corp., 151 White Ave., Brooklyn 11, N. Y.

Solvent resistant Neoprene compounds from rubbers in less than two hours, the manufacturer reports, compared with eight hours for other methods. Fiber 151 has a high flash point and low toxicity. Cost is \$2.15 per lb. at 49 lb. container—Arad Chemical Co., Milwaukee, Wis.

High-temperature wire enamel, Rosal, is stated to be less expensive than silicone varnishes and gives better heat shock characteristics. Product is also said to show no tendency to crack—Schmoedley Varnish Co., 250 Congress St., Schenectady 1, N. Y.

Form brake develops 12 ton of pressure with a 36-in. length of bed. Ram features stroke control that can be preset and the ram stopped or reversed at one desired point. Di-Auto Hydraulic unit has a 60-stroke-per-minute



Above: B-52 bomber on flight base at Boeing Seattle plant.

Left: B-57 bomber in test flight.

America's big jet bombers are meeting all schedules

Boeing B-52 global jet bombardier now well into the advanced stages of their flight test program—while production airplanes are coming from the factory on schedule. The airplane engaged in the continuing test program are averaging nearly twice as many flight hours per month as any previous high-performance aircraft.

This record, in part, is a result of the success of the B-52 design. It is also a reflection of the large engineering resources of Boeing's new Flight Test Center—the largest, most complete facility of its kind in the country. This Center enables Boeing to achieve a higher

percentage of productive flight test time than was possible before. Programs are planned far ahead, and so organized that on each flight, tests begin the moment the aircraft's wheels leave the ground.

Another part of the B-52's success stems from the earlier experience Boeing gained designing and testing the B-47. The high-altitude front-line B-47 today is the backbone of Strategic Air Command's striking force. It has logged hundreds of thousands of hours of powered flight at extreme altitudes.

Boeing's experience in this field is unique. For in addition to building

many high-altitude, multi-jet aircraft than any other company, Boeing 18 years ago developed the world's first jet-powered transport, the Boeing Stratoliner, and the world's first jet-powered bomber, the B-29, mighty jet weapon of World War II.

Out of the Boeing background grows America's dominant position in the field of powered, high-altitude, multi-jet aircraft. It is a position backed by one of the country's largest pools of engineering manpower, by advanced research facilities, and by the Boeing tradition of creating airplanes that open new eras of military and commercial flight.

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production rate on a 4-in. stroke. Price, \$1,155 — O'Neil-Iron Manufacturing Co., 516 Eighth Ave., Lake City, Minn.

Belt grader and under, Supercopied No. 175, ultra belt speeds exceeding 18,000 fpm—using 3 1/2-in. belt. Bench at pedestal version available at prices from \$245,500—Anchor Machinery Co., 129 W. Deane Grove Ave., Burbank, Calif.

Electric actuating table has automatic linear adjustable from six to 54 inches per minute. Repeat accuracy is stated to be 0.001 in. Table is available in a packaged unit with an electric impact hammer—Black & White, Inc., 445 Watkinson St., Newton 55, Mass.

Adjustable draw key for locking Most Taper shank tools in machine spindles in one wrench adjustment comes in sizes to fit machines with spindle diameters from 1 through 5 in. and draw key slots from 21/16-in. through 1/4 in. These are no extra attachments to machine spindles—Davis Tool Division, Coddington & Lewis Machine Tool Co., Fond du Lac, Wis.

Spent monitor, check valves provide capacities of one to eight gallons per minute, make reports—Spurring Systems Co., 3281 Macdonald St., Ballwin, Ill.

Service By-Way studder extracts studs with only 4 in. exposed length without damaging threads and gives fully adjustable control over drawing depth, the make states—E. V. Wilcox, Inc., 125 Broad St., Stamford Conn.

Type B-1 Flu, for stress alloy bearing of stainless, chromium best oxidizing of boron, chromium and tungsten carbides. Taken having at 1,400 1/2,000 for phosphate, construction details—Hercy & Thomas, 62 Fulton St., New York 15, N. Y.

High-speed Switching-Speed rotary switches for compound or undrilled hand control can be furnished for any speed up to 15,000 rpm. Motorized units is stated to be one million cycles—Tung Industries Products, Inc., Lakeville St., Bedford, Ohio.

High-frequency generation for induction and dielectric heating are 35 in. wide. Generation are used for frequencies up to 9,600 cps and various rates for 450 to 12 1/2 cps—New Rochelle Tool Corp., 323 Main St., New Rochelle, N. Y.

Annual alignment handle lubricating and penetrating oils, rust inhibitor and all-weather cleaner. Cars contain are easier—Crown Industrial Products Co., 1612 Amsterdam St., Woodstock, Ill.

R-652 actuates the tailwheel power steering installation in De Havilland of Canada's DHC-3 Otter



The R-652 operates at 10-40 psi at maximum operating torque of 1000 in. lb. Overload air clutch released at 40, 2000 in. lb. Magnetic clutch will hold maximum load with 12 volts min. supply. The R-652 weighs 4.15 lb.

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Drawing courtesy of De Havilland Aircraft of Canada, Ltd.

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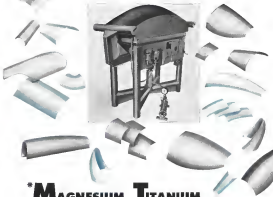
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By Lt. Cmdr. H. B. Ward 3rd, USN

The "zone of confusion," long a characteristic shortcoming of automatic direction finders, can be eliminated to provide a single clean-cut reversal of the ADF needle over the station, for aircraft attitudes up to several thousand feet.

This conclusion is based on a theoretical investigation of the basic problem, followed by flight tests which confirmed the theoretical findings.

Of particular importance, the new technique can be applied to existing ADF's without structural modifications, by inserting a phase shifter in the sense antenna input which will vary phase shift angle proportional to the incoming signal frequency, up to a maximum value of about 30 deg. The principle can be demonstrated by de-tuning an ADF receiver slightly.

Explanation

A theoretical investigation into the zone of confusion problem by the test procedure in question which predicts these points in space where the ADF needle will try to reverse. The equation is that of a roughly conical or paraboloidal surface infinite surface located as shown in Sketch A, above right.

The tilt angle (ϕ) of the conical surface is determined by the utilization of an airplane sense antenna system, the location of its longitudinal location along the plane's fuselage. Other variables in the equation include:

- Phase reference of the ADF loop antenna signal by the receiver.
- Airplane attitude above the ground.
- Aircraft track and location relative to the vertical axis of the radio station.
- Frequency of the station carrier wave.

If the sense antenna pattern were truly vertical (tilt angle zero), and if the receiver phase shift were exactly 90 deg., there would be no zone of confusion problem. However, both of these are difficult to achieve because of surface and receiver design considerations.

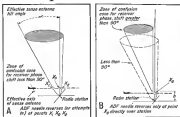
Under conditions when the receiver phase shift is less than 90 deg., there are three positions of the aircraft over the station where the ADF needle will try to reverse, as shown in Sketch A.

It will try to reverse when the plane first enters the conical surface (X₁) when the plane passes over the station (X₂), and when the plane again enters the conical surface (X₃).

The same condition exists even when

AVIONICS

Phase Shift Cleans Up ADF 'Confusion'



DIAGRAMS SHOW how shift of phase angle can end confusing ADF needle reversals.

the sense antenna will a velocity vector (the aircraft's air speed vector), it receiver phase shift is less than 90 deg. The conical surface would be a truncated cone about the station axis, and much more complicated than that shown in Sketch A.

The gradient of the ADF needle would be determined by whether the needle has reflected time to completely reverse before another reversal point is passed. This would depend upon the speed of the airplane and the true constant of the ADF loop drive servo system.

If instead of less than 90 deg., the phase shift within the ADF receiver is greater than 90 deg., then the conical surface effectively is elevated in space above ground, as shown in Sketch B.

An airplane flying below the tip of the conical surface completely misses two of the points of reversal, encountering only the correct one (X₂) directly over the station.

The amount by which the zone of confusion cone is elevated above ground is determined by:

- The angle of the effective sense antenna.
- Receiver loop antenna phase shift.
- Station carrier frequency.

A graph relating both of these relations depicts the height of cone elevation (h) and receiver phase shift and sense antenna tilt angle is shown on p. 74, top.

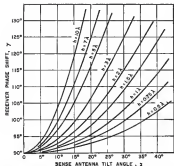
The elevation (h) is shown in terms of radio station center wavelength. Second graph on p. 74 shows the

Zone Of Confusion

The "zone of confusion" has long handicapped the automatic direction finder, one of aviator's oldest, yet still widely used, aids.

As the airplane approaches the radio station to which the ADF is tuned, the indicator appears to be confused, not knowing exactly where the plane has passed the station. The ADF needle may first point ahead, then start to turn around. Then it may return to the ahead position, and finally has around again. When passing another station, the ADF needle may not differently, but still eventually. This makes it difficult for the pilot to use the radio station as a position check point.

The author of this article suggests a simple cure which can be applied to existing ADF's or designed into new systems. The cure is the outgrowth of an investigation made by the author at Stanford Research Institute during a 10-week industrial equipment test, part of a three-year course at the Naval Postgraduate School in Monterey, Calif. The investigation was reported in part by USN Funds.



ELEVATION OF ZONE OF CONFUSION CONE above ground (ft) in wavelengths of carrier as function of sense antenna tilt angle and radio phase shift angle

conversion of "h" into feet above ground.

For reasonable phase shift angles and antenna tilt angles, the approximate value can be elevated 1,000 to 1,500 ft.

Flight Tests

Having thus predicted what should happen, a series of flight tests were flown in which the variables were controlled, and the "point forward" or "point aft" results to the loop were recorded on an instrumented recorder. The loop was kept pointed 90 deg to the right by disconnecting the leads to the loop drive motor.

The point is here that the plane pointed over the station was established by a ground observer, with a portable radio, located at the station site. The observer sighted up a vertical structure and gave the aircraft a "mark" when it was over the station.

Flight test results agreed extremely well with theoretical predictions. When the phase shift of the receiver was adjusted to a value greater than 90 deg, the tip of the cone of confusion came weakly left of the ground, making it possible to fly under the surface.

This produced a single clear-cut needle movement which occurred when the plane passed over the station.

Flight tests also showed that when the plane flew through the "zone of confusion" there was no time where the needle would have been wandering aimlessly about. Instead, it always was

moving under positive control of the radio station signal, except for the slight overshoot, the correct marker was positioned, and at the point of passage over the station (if the station was truly).

When the plane is at any point inside the correct marker, the ADF

needle trade to point away from the ground station. At all points outside of this marker, the ADF needle is driven toward the correct bearing.

Anyone can verify the validity of this marker as follows:

• Tune in station on ADF and note maximum bearing indicator reading.

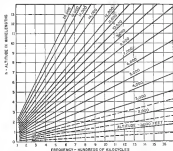
• Decline the receiver toward a higher dial reading so that the bearing indicator drops back to about 85% of the maximum reading previously noted. This provides receiver phase shift of more than 90 deg.

• Fly the airplane at or below an altitude equal to 2,500,000 divided by the frequency of the station in kilocycles (kc). For example, if the radio station broadcasts at 500 kc, fly toward the station at 5,000 ft altitude or less (2,500,000/500). Only one ADF needle reversal should take place, and that when the plane passes directly over the station.

If the receiver is now returned to the maximum reading (first mark), and then turned toward a lower dial reading until the maximum reads about 85% of the maximum reading, the normal phase shift will be less than 90 deg, and the ADF will behave in its normal confused manner.

The results obtained from this investigation show that it should be possible to produce simple ADF reversals over any station in the continental 100 to 1,750 ft. band below an altitude of 3,000 to 4,000 ft, providing the tilt angle of the sense antenna is not excessive.

Manual de-tuning of the receiver can



THIS CONVERSION CHART RELATES altitude (ft) of zone of confusion in wavelengths to feet as a function of the carrier frequency in kilocycles

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to used in introducing the required time intervals phase shift, but this complicates ADP tuning procedures and it introduces the possibility of human error in the operator.

The same result could be achieved by employing a phase shifter in the second antenna input, which introduces a negative phase shift whose angle is approximately proportional to radio signal frequency, up to a maximum of 30 deg.

This has a disadvantage for long-distance ADP operation because the torque developed to turn the ADP loop decreases with phase shift (from 90 deg.).

Conflicting Requirements

This points up a large conflict in ADP requirements for long and short distance operations. Close to the station it is desirable to have a small search antenna tilt angle, a high-speed loop drive motor, and a phase shift of more than 90 deg. in the receiver.

For long-range use, however, the ADP needs a short search antenna cable run to reduce losses, a longer loop drive motor constant to damp out static interference and a phase shift of approximately 90 deg.

The solution may be a dual-speed motor and the use of two separate search antennas. At longer ranges, a search antenna located near the axis of the plane would be used, without phase shift, and with the slow motor speed. For close work, the ADP would be switched to a small search antenna for short back on the frequency, phase shift would be increased beyond 90 deg., and motor speed would be three times as fast.

Searchers might be accomplished manually by the pilot or automatically, according to received transmitter signal strength.

New Subminiature Devices on Market

A micro-miniature relay, especially the model over developed with coils rated at 2 amp., is one of several recently announced designs.



components of interest to designers.

The new General Electric relay, heretofore sealed, reportedly withstands more than 50G shocks and 200 vibrations between 55 and 500 cps.

Model CR 2791C230, measuring 6.5 in. high, comes in standard coil resistance of 800 ohms for 25-v. d.c. operation, or with coils up to 4,500 ohms.

CR's Model CR 2791C230, measuring 1.12 in. high, is a contact-sensitive model with maximum coil resistance of 9,000 ohms and a pick-up current of 1.2 ma.

Other size sub-miniature components include:

• Contact sensitive for printed circuit boards: Kemptek, Ft. B 3510, measures 1 in. square, with terminals for mounting and dip soldering on printed



boards. Associated circuit plug-in Pt B 3510, and connector 1/2 dia. x 1 in. long.

Manufacturer: H. H. Wagg, Inc., 515 Bellevue Ave., Toledo 9, Ohio.

• Ceramic rotary switch, Series M, occupies a panel area of less than 1 1/2



sq. in. and employs ceramic wipers with con. silver contacts. Single-pole style has 15 slugging type contacts and is available in many combinations including multi-deck units.

Two or three poles per deck also are available. Contact capacity is 2 amp. with full-on voltage of 1,000 v. at 50 cps.

Manufacturer: Elex Data Co., Dept. 52, 291 Central Ave., Newark, N. J.

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A tiny relay selector switch, only $\frac{1}{8}$ in. in diameter x $\frac{1}{16}$ in. long, was recently put on the market.

The new series 311 selector switches are available in single-pole/12-position, two-pole/negation, three-pole/10-position, and four-pole/three-position models, with standard $\frac{1}{8}$ -in. shaft and $\frac{1}{16}$ -in. locking. Current rating of contacts is 50 ma. at 500 v. a.c. or d.c., 500 ma. at 10 volts.

The manufacturer of the switches is Chas. H. Mansel Co., Inc., Dover, N. H.

Other new miniaturized components include:

• High-drag torque power transformer can be operated at 400 to 6,000 cps, from -55C to 155C, with up to 95% efficiency, according to manufacturer. Transformer occupies only 1.45 cu. in., mounts in hermetically sealed plug-in type case.

Manufacturer: Communications Accessories Co., Hickman, Mo., Mo.

• Indicator films, new series of small high-contrast film strips, are available in ratings of 6.3 to 10 sec., 125 v. d.c. or a.c., for 400-cps use. Units meet government MIL spec, can be operated at -55C to 85C, and come in hermetically sealed cans that have solder terminals.

For engineering data, write to Technical Literature Section, Spangco Electric Co., 127 Marshall St., North Adams, Mass.

• Toggle switches, rated for 10 amp. at 50 v. d.c., in SPDT and DPDT models, reportedly are half the size and weight of their predecessors.

SPDT unit weighs $\frac{1}{16}$ oz., measures



Small Actuator

New laser actuator that weighs only 1.4 lb. but has made 2750 smaller than its predecessor by adopting motor and reduction gearing. Speed of the new Type AC-2-2000 can be changed from 14 to 50.0 in./min. in convenient increments by adjusting only two gears. Unit has built-in dip switch and limit switches and is designed for use in high ambient temperature, according to manufacturer. John Oster Manufacturing Co., Arkansas Division, 1 Main St., Exeter, N.H.

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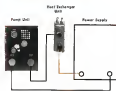
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Glenn L. Martin
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The company has declared "No transaction is currently proposed which would require the issuance of any shares of the authorized but unissued stock."

There should be no impact on the future of the acquisition of another company or companies, a

merger, options to purchase or buy new shares, stock dividends, sale of additional capital in a leveraged market or the other corporate purposes in the discretion of the directors."

In other words, management has complete flexibility to sell additional securities if it so desires.

General Dynamics
The General Dynamics 500-million share of 34% convertible debentures was not received, being initially offered at 102 1/2 (37,253) but obtaining an immediate "hot" public price of around 116 (31,166). They have since sold at 106 (31,000).



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A big attraction, here, as will be true with the Lockheed case, is the conversion feature. The General Dynamics debentures are convertible into common stock at \$75 per share.

United Aircraft

United Aircraft has received stockholder action to issue up to 7.5 million common shares. The total previously authorized was 4.5 million, of which 3,241,004 were last outstanding. Further, a new issue of 360,000 shares of preferred stock was also authorized.

After outstanding at the present time are 232,442 shares of the preferred stock at par value of \$100 each. This pattern was offered only in 1961, shortly after Pearl Harbor, at a time when aircraft markets were expanded. To make the stock attractive it was found necessary "to set a 5% dividend rate."

Management, in April, stated "Under present conditions, the stock and financial position of the corporation do not seem to warrant the payment of such a rate. Accordingly, the board of directors is now considering the redemption of the entire issue of outstanding preferred stock out of funds which, for the most part at least, it is expected will be received from the sale of stock of another class, thus avoiding any substantial reduction in the working capital of the corporation."

The directors plan to adopt a definite financing program at a meeting to be held after the annual meeting at stockholders on Apr. 26, 1985, if market conditions should then be favorable. At the present time they have in mind an offering of new common stock to the holders of outstanding common stock, per share, in an amount sufficient to raise approximately 500 million to 75 million, the proceeds of such offering, together with any other convertible funds which may be required, to be used to redeem the entire issue of new outstanding preferred stock.

"However, between now and the time of the annual meeting, conditions may change in such manner as to lead the directors to devise some other program, such as an offering of part of the preference stock, if such stock is authorized by the holders of the common stock at the annual meeting, or the directors may determine to defer the new financing and the redemption of the present preferred stock for the time being."

Although no conclusive comment has as yet been revealed by United Aircraft, the company may be coming to do such public financing as will lead to the redemption (at \$102.50 per share) of its present preferred stock.

Further, it will have the means to issue quickly to raise additional money for new capital to meet possible future needs. —Selig Altschul



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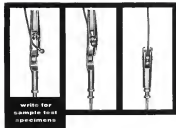
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- June 6—Canadian National Air Show Toronto
- June 8-13—American Meteorological Society 157th National Meeting Hotel Fairbanks, Kasco City, Mo.
- June 9-14—Sixth All Women's International Air Race Washington, D. C., to Havana, Cuba
- June 10-15—Twenty-first International Aviation Display, LeMoyne Field, Paris, France
- June 12-17—Society of Automotive Engineers Golden Anniversary Meeting Club Hotel Madison Hotel Atlantic City, N. J.
- June 11-20—Pan-American Photo Council, Photo Proficiency Contest, Golden Field, Butler, Pa.
- June 11-20—Women's Aeronautical Association Monthly Display, Little Rock, Ark., to Sioux, N. D.
- June 15-24—Round course on Secondary Laser Control University of Wichita
- June 16-18—American Society of Mechanical Engineers, 19th National Applied Mechanics Conference including sessions on aerodynamics and guided missiles recently Kew-Forest Polytechnic Institute, Tex.
- June 17-24—Polish-American Aeronautical Letter symposium, 5th Anniversary Conference, Paris
- June 18-25—Philadelphia (near Chamber of Commerce is, closed annual Transcontinental Air Clinic, Palm Springs, Calif., to Philadelphia
- June 19-25—American Society of Mechanical Engineers, semi-annual meeting, with air aviation sessions, Hotel Statler, Boston
- June 19-25—American Rocket Society, semi-annual meeting Hotel Statler, Boston
- June 20-21—Institute of the Aeronautical Sciences and the Royal Aeronautical Society of Great Britain, 5th International Aeronautical Conference, 4th Building, Los Angeles
- June 20-25—Symposium on Electromagnetic Wave Theory, University of Michigan Ann Arbor, Mich.
- June 21-25—In-depth short course on Propulsion Technology, Massachusetts Institute of Technology, Cambridge
- June 21-25—American Distributors & Manufacturers Assn., Silver Anniversary Meeting, Flamingo Hotel, Las Vegas, Nev.
- June 21-25—Institute of Navigation, 13th annual meeting, Harvard AFB, Massachusetts
- June 27-30—American Society for Test Engineering, 5th annual meeting, Chatham-Holden Hotel, Atlanta City, N. J.
- July 2-4—International Aviation Exposition Detroit
- July 2-4—Navy Force Assn., annual annual Dail T. Rich Memorial Trophy competition for Air National Guard jet pilots Los Angeles in Detroit
- July 2-4—Civil National Meeting Contest (Haw PHL, El Paso, N. Y.)



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would add Chicago as an intermediate point between Milwaukee and Detroit, providing that all flights along New York, Detroit and Chicago must originate or terminate at Minneapolis or points west, or at New York.

The example would also add service by Capital to the New York-Detroit route via Syracuse, Rochester and Buffalo now served only by American. The New York-Buffalo segment is now the largest domestic traffic market without competitive service. Since Capital is not a transcontinental carrier, the airport back to certification would cause line diversion from Atlanta than would the introduction of Capital, either applicant for the route.

Airline factors in the future of Capital is the suburban community

of interest between the New York cities and numerous cities in Michigan served by the airline. Capital also is noted for removal of long haul and one-stop restrictions on its Detroit-New York route to provide additional on restricted service.

The report favors a change in Eastern's restriction at Pittsburgh, Gary, Gary, Indiana is subject to a "closed-door" restriction which prohibits carriage of local traffic between Pittsburgh, Alaska/Canada, Chicago and Detroit.

Crack then would specify that all flights serving the three points from Pittsburgh be required to originate or terminate at Knoxville or further south in place of the "closed door" restriction.

CAB Liberalizes Overseas Charters

A liberalized charter policy for trans-Atlantic travel that cannot be achieved by Civil Aeronautics Board members, CAB authorized an investigation to determine if an overseas charter could be permitted to perform all line flights.

The new trans-Atlantic charter policy, marked by a first-to-one vote, a 4-3 decision. Chief George Bunting, abolished the previous restrictive requirements for an exemption that the charter be performed by "seasonal." This eliminated the right of first refusal by the regular carrier since that was also for the account of one group or for foreign military personnel.

The Board report noted that the new policy is primarily intended for the summer season when seasonal aviation may be made on the basis of experience that is gained during this period.

Although the intent is to provide greater opportunity for charter service, the Board said it must proceed cautiously in order not to jeopardize the existing scheduled trans-Atlantic services which are based on an adequate air transportation system.

To ensure further the potential damage to regular scheduled service, CAB has also advised the distinction of charter continued in the commercial airplanes.

The prohibition of the offering by a direct carrier of charter service to individual members of the public, and the performance by a direct carrier of charter service for an individual or group of passengers, or for persons paying for such charter service as seasonal or excess of the direct carrier's published charter rate.

Chief George Bunting said the majority that there was no need for liberalization of the trans-Atlantic charter policy which, he said, was adopted in 1951 following a period of widespread opposition with a vote of 10-4 against and I am not sure to move in that direction again.

He concluded there have been no complaints from the public. George said that under the normal requirements, scheduled trans-Atlantic charter services grow and prosper, while at the same time all legitimate charter service is handled.

More Tourist Flights

Pan American-Globe Airways will increase its tourist service to the west coast of North America in seven flights a week, when it adds two DC-8 flights between Miami and Lima twice a

SAS Trans-Polar Flights Sold Out, Additional Service Planned in '56

Los Angeles-Scandinavian Airlines System's Polar Route between California and Europe has gained quick public acceptance.

The airline reports that its Polar flights to Europe are sold out for the next two months—the first summer season when the Polar flights have been available.

"We are only sure that we do not have additional equipment to enable scheduling of more trans-polar flights per week," says SAS President Bengt Thorsell.

The carrier now makes three flights weekly in each direction over the route.

The third Polar flight was added a month earlier to the schedule in order to handle the increasing traffic. This makes available 416 seats per month, all of which are booked out through July and wellbeyond through September.

Nearly 1,600 overseas passengers have been carried in both directions since Polar service was inaugurated last November, SAS reports.

Schedule will be stepped up next year to handle the growing traffic demand.

When the airline starts delivery of its DC-7Cs in 1956, it plans both four-hour and longer-haul flights. There will be one stop flight. Present DC-6B flights stop at Winnipeg and Greenland.

SAS anticipates offering two types of tourist service, a mixed flight with 52 seats and 12 sleepers, and an all-tourist flight accommodating about 75 passengers.

Seven SAS first-class flights will carry from 16 to 44 passengers.

Also in SAS plans for 1956 is a commercial route from Copenhagen, via Anchorage, Alaska, to Tokyo. Such service would include two to three flights weekly. There will start in early fall.

SAS President Thorsell feels Polar flying is a logical step in its route program. Development of another route of the globe must already be underway.

A few weeks ago the passenger carrier flew the second passenger flight, a charter flight, across the geographical North Pole from Scandinavia to Japan.

Two weeks ago the airline asked the Scandinavian government to approach the U. S. State Dept for traffic rights between Anchorage, Alaska, and Europe.

The airline, prepared to start the new service upon receipt of the DC-7Cs,

says it will cut 10 hours off the present six-hour time between the European continent and the Far East.

"The use of Alaska is an intermediate stop now changing the public's conception of it," Thorsell said. "It has proved not to be thought of in terms of the center point of a long transatlantic rather than the end of a one-way street."

Pan American has asked the Civil Aeronautics Board for permission to fly from California to Europe on a route similar to that of SAS.

"We were particularly pleased with the American's request . . .," says Thorsell. "These endorsements we consider further evidence of the acceptance of this new route to Europe."

BEA Credits Viscount For First Net Profit

London-British European Airways reports a net profit of \$148,000 for 1955, the airline's first move into the black after eight and a half years of heavy losses.

BEA attributed the profit to its 24 Viscount aircraft and a company-wide economy drive.

The company had not expected to get

House Approval

The House passed the Road 1956 Budget for Civil Aeronautics Board and Civil Aeronautics Administration without change in the recommendations of the Appropriations Committee (see p. 55).

out of the red until after 1955, a forecast based largely on 1955's \$4,767,200 loss.

This prediction was upset as Viscount load factors increased to a point where cost (including transport) averaged a \$100.00 profit last year, says BEA Chief Executive Peter Mansfield.

With its combined fleet of Viscounts and 39 de Havilland Argonauts, BEA's fleet of 179 aircraft carried 17.6 million passengers and turned 19% more traffic than in 1953. Operating expenses increased by only 4%. The airline carried 54% of its air traffic between Britain and Europe, covering approximately 25 million miles without a single fatality.

BEA's chairman, Lord Douglas of Kirtcaldie, admits the Viscount was less economical in operation on short hauls than the post-war Argonauts. But he says the Viscount's speed, economy and lack of vibration carried strong appeal among passengers traveling on the airline.

The airline's utilization rate for its Viscounts is well over 2,000 hours a year.

Viscount Sales Gain

Viscount-Airways' Viscount is strengthening its sales lead on other medium-haul transports. Last week the builder had probable contract orders two airlines plus two firm orders.

Possible buyers were Continental Air Lines and KLM Royal Dutch Airlines (AW May 25, p. 7). Firm contract came from Trans-Atlantic Airways, also three new transports and from U. S. Steel Corp. for three business travelers.

In London, Continental President Robert F. Orr, making a two-week tour of Britain, indicated that the airline hopes to order 10 to 15 DC-7-passenger Viscount 630s.

"We are now to evaluate the statistics, but I should say there is very good scope for our ordering Viscounts," Orr said. "We can get deliveries at the latter version (800) by August 1957."

Monsieur KLM Executive Vice President F. Bessens visited in London last week for final talks with Viscount-Airways about a Viscount 600 contract.

The negotiations followed several earlier meetings with the builder by KLM President J. A. Ales.

The Dutch carrier is considering a fleet of 10 Viscounts for delivery as two years. An order would be the first serious penetration of a U.S.-supplied European airline.

Trans-Atlantic announced the government had authorized the new Viscount contract. The latest order would be in addition to 10 transports already purchased, including one replacement for an airliner that crashed last year.

TAA said it hopes to have the first new Viscount operating by the end of 1955.



Puerto Rico Opens New Airport

San Juan, P. R.—A new \$15 million International Air Terminal has been inaugurated at the San Juan-Caribbean International Airport.

The airport, inaugurated in conjunction with Armed Forces Day exercises replaces the outdated Isla Grande airfield. It is designed to accommodate all classes and has a capacity of 750,000 passengers a year.

Opening of service at the international terminal brought to light a new terminal passenger change restricted by the airport authorities in force after the no problems involved in housing federal services.

The service change of 15 cents, to be applied to all incoming passengers who must go through inspection, has been accepted with great reluctance by the airport. Airport authorities note that the change is necessary to pay for space occupied but by such federal services as Immigration and Naturalization, Customs and Public Health.

The processing change, which will

apply to over 50% of passenger traffic, will be collected by the airlines through arrangements with a collection agency.

The airport, built in a concrete terminal building which includes a 10-room hotel. Facilities include a single 7,000-ft. runway, a second parallel runway planned.

Soviet Airports

Russia has launched an ambitious airport terminal construction program at high traffic points throughout the nation, according to the official government newspaper Izvestia.

The chief administration of the Civil Air Fleet reported plans for new terminal buildings at 20 sites. Projects to be started this year are at Minsk, Sakon, Adler, Yuzov, Nizhny, Tbilisi, Novosibirsk and Chelyabinsk.

Work will be completed at Minsk's Vostochny Airport, and at Arkhangel, Osk and Alma Ata.

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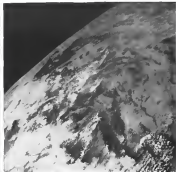
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Evasions In The Defense Department

The Washington press corps and the American people to whom this report have been given another very demonstration of the careless, inaccurate and evasive manner in which the Department of Defense publicly handles matters of life and death concern to every citizen.

The success of this latest demonstration was a press conference held by Defense Secretary Charles E. Wilson last week in the Pentagon during which he confirmed details of the types and numbers of Russian bombers and fighters exclusively reported by *ARMANDO WIZAC* as he May 21 news in having participated in the recent aerial dogfight over Moscow.

Here are some examples of what we and other veteran Pentagon reporters consider to be evidence of the careless attitude toward vital facts by top level Defense Department officials.

On May 11 the Department issued a brief, vague statement on the Moscow air display mentioning four types of Soviet planes. *ARMANDO WIZAC* reported on May 25 that these types appeared as operational numbers and a new supersonic day fighter was seen in formation of 50 planes. Our story was widely reprinted on the front pages of daily newspapers and broadcast on radio and television on the same day. On May 26, the next day, Secretary Wilson issued a statement confirming the appearance of the 50 new supersonic fighters and confirmed the numbers of all-weather fighters, transport bombers, twin jet bombers and four jet bombers cited by *ARMANDO WIZAC* as visible in the Moscow fly-by.

Questions and Answers

When asked by *ARMANDO WIZAC* military editor why these facts were not in the original Department of Defense statement, Mr. Wilson replied:

"The statement on May 11 was a very general one." Mr. Wilson was asked by *ARMANDO WIZAC* Washington editor if he planned to release publicly the pictures of these Russian planes flying over Moscow that are now available to the Pentagon. He replied:

"We'll think about it."

When asked if he had changed his mind from a year ago when he stated the Russians were concentrating on building a purely defensive Air Force, Wilson said:

"Well, no airplane isn't very much airplanes to fight a war with and there isn't any question that the first big development in Russia was on the MIGs, the defensive airplane and then built a lot of them. They probably kept building them too long from our point of view. We would rather have spent the money on an improved and better one quicker. That is the technique over here."

Mr. Wilson knows or should know that the MIG-15 went out of production in Russia late in 1952 after 15,000 were produced. This was the year before Mr. Wilson made his "defensive" statement.

He also knows or should know that we are still building the F-86 Sabre series that was the MIG-15's contemporary.

He should know that we did not get into production on the F-100, successor to the Sabre, until late in 1953.

He also knows or should know that by July 1954 Lt. Gen. Earle F. Partridge, commander of the 5th Air Force, reported that the MIG-17, the Soviet successor

to the MIG-15, was already in squadron service with Red Air Force units opposite FEAF in Siberia. The first F-100 combat wing was equipped late in 1954, grounded for several months due to technical troubles, and became operational early in 1955.

Misquotes President

Mr. Wilson also misquoted President Eisenhower in his formal prepared statement. Mr. Wilson said the President said at his news conference last week, "it is not just true that we no longer have an superiority." What the President actually said was "... we may not have as much (MIGs) as we should like at this moment. I don't know the exact number, but to say that we have lost in a headlong all of the great technical development and technical excellence as well as the number in our total aircraft is just not true."

Nobody has stated we have lost anything "in a headlong." What *ARMANDO WIZAC* and other critics of the Defense Department attitude on Russian armor have said is that the 1955 Moscow air display offered definite proof that during the past three years our once wide margin of technical superiority had been whittled to a very thin margin and that Russians are moving at faster rates of development and production now than are the U. S. Air Force and Naval aviation. Neither Mr. Wilson nor anybody else in the Pentagon or White House has taken direct issue with that statement.

The May 13 Department of Defense statement noted that the Russian bomber display "obviously establish a NEW basis of our estimate of Soviet progress." In his May 24 statement, Mr. Wilson said on the same subject: "These are facts which are NOT NEW to the Department of Defense but which are currently causing public discussion about the relative air superiority of the United States."

Mr. Wilson is still apparently confused about how many jets jet fighter flew which year. He said: "They displayed more than 40 new modern bombers known for the first time last year (1954) as a prototype." Actually, in the 1954 Moscow air display the Russians flew a formation of nine of these twin jet medium bombers, indicating at that time that they were out of the prototype stage and into production.

Records of the last three years have proved that Mr. Wilson has been wrong on every major evaluation he has made on Russian progress development since he took office in 1953. His performance at the Pentagon press conference last week on this issue of vital superiority to other Americans did not inspire any new confidence in his accuracy or candor on the rapid rise of Russian jet aviation.

Nor did it inspire any confidence that Mr. Wilson's new requirement that all Defense Department public statements must make a "constructive" contribution will be administered either wisely or well.

The American people deserve more precise and accurate facts, more candor and a much deeper sense of public responsibility on the part of top level defense department leaders before they should place nearly half of official utterances on the Russian armor controversy.

-Robert Hots

How Harvey
puts
aluminum
to work
for you...

Here are a few of
many ways Harvey
makes your product
easier to manufacture,
easier to sell

Many years of solving the special and difficult design problems of military types developed the "practical imagination" that characterizes the entire Harvey approach. Our Field Engineers will gladly sit down with your own designers to discuss in detail how Harvey's experience can put aluminum to work making your product easier to manufacture, easier to sell.

EXTRUSIONS For decorative as well as basic parts, custom-designed aluminum extrusions replace riveted and welded assemblies. Actual assembly increases strength and simplifies fabrication.

STRUCTURALS High strength, light weight, workability, corrosion resistance. Aluminum extrusions combine all virtues. Are ideal as basic load-bearing members.

MACHINING STOCK Harvey deep-drawn bars and round stock on a new mark in surface grain structure—resistant from surface factors. These means fast, chatter-free cutting, long tool life, low rejects and low finish.

FORGING STOCK If you make your own forgings in quantity, Harvey extruded forging stock can save many unnecessary steps. Custom designed extrusions combine all virtues. Are ideal as basic load-bearing members.

EXTENDED PIPE AND TUBE Seamless, uniform in structure, size and shape. Ends and inside made and cut easily formed. Useful in applications ranging from portable hydraulic systems to aircraft test equipment.

DRAWN TUBE Combines strength and high finish. Used for TV antennas, sensors, fuel nozzles, probes. Cold drawn for structural uniformity. Temper specially controlled for workability.

PRESS FORGINGS Where parts must combine maximum strength with strength, size and shape, Harvey aluminum forgings offer completely solved a designer's problem.

IMPACT EXTRUSIONS Two-valued, tubular structures can be produced by this method and held to very close tolerances. Machining is practically eliminated, and scrap is greatly reduced.

AUTOMATIC SCREW MACHINE PRODUCTS The West's largest installation of multiple spindles screw machines can produce your manufacturing needs. Harvey controls your job through every step, beginning through quality control.

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ALUMINUM...REVENOM...PROFESSOR...Harvey does all these as a leading manufacturer of aluminum extrusions in all sizes and in all shapes, special extrusions, press forgings, extruded forgings, extrusions, and in the following areas: pipe, tubes, impact extrusions, extrusions, screw machine products and related products. Also custom products in alloy steel and stainless steel extrusions.

Up front in the

Turbo-Prop Race

Allison Model 501 for commercial use develops more power for its size and weight than any other Turbo-Prop engine built today

Pay-off on ten years of Turbo-Prop pioneering is the Allison Model 501 engine, commercial version of the T56 which recently completed the most exacting model test ever required of a propeller-type engine.

Now in production, this engine develops 3750 horsepower, or 2.3 horsepower per pound of weight—a power-to-weight factor better than any other Turbo-Prop engine available today, and almost $2\frac{1}{2}$ times that of contemporary piston engines.

In a typical application, the Allison "501" saves one ton of weight per engine nacelle, and has an engine frontal area of only six

square feet—less than half the frontal area of a reciprocating engine with comparable power. Its amazing compactness cuts speed-reducing nacelle drag as much as 60%.

These advantages will enable cargo transports powered with these engines to carry heavier payloads faster at far less cost than present aircraft.

And in passenger operation, smooth-running Allison Turbo-Props will provide quieter, more comfortable flights—and permit speeds better than 7 miles a minute.

Allison Turbo-Props are engines *in being*—not merely on paper. They are the first American Turbo-Props being built and delivered in production quantities, and have to their credit more actual flight experience than all other U.S. Turbo-Props combined.

ALLISON Division of General Motors
Indianapolis, Indiana

Builder of Turbo-Jet and Turbo-Prop Aircraft Engines



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More than five-and-one-half million hours
of turbine engine flight time...

experience where it counts most—in the air!